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Vol. VII. NEW YORK, APRIL 10, 1886. No. 15.

THE enemies of the Bell patent were greatly pleased at the likelihood that the government suit would be tried before Judge Baxter, whose exalted reputation was that of a "patent smasher." And now Judge Baxter is dead.

THE corporation of Leeds, England, shows a commendable spirit of enterprise in calling upon the storage battery to aid in the illumination of its hall in that town. The gas engine which drives the dynamos for illumination at night has hitherto stood idle during the day time, but is now utilized for charging the storage batteries which furnish current for a number of arc lamps. This plan is worth imitation, and we hope the hint will not be lost.

PROBABLY the lawyers are among the people who do not feel particularly anxious to have the telephone patent declared void. Up to the present time they have earned some very liberal fees through telephonic litigation, and now the Government comes forward with retainers of $1.000, fees of $3,000 and $5 000, and per diems of $70 and $100, to say nothing of occasional "refreshers" and "reminders." No small portion of the Bell Company's earnings has gone in legal expenses already, and the end is not yet.

PARTICULARS are given by our Philadelphia correspondent this week of a decision against the Western Union Company for damages, arising from a mistake in a message. In this case, the receiver of the message had his suspicions as to its accuracy, but the operator told him that he had already ascertained that it was all right; and thus the company finds itself paying for fat young turkeys at the rather unusual price of thirty-three cents per pound. The decision of the judge, on appeal, seems fair and in accordance with the facts.

WHILE vetoing the elevated electric railway bill passed by the City Council of St. Louis, the mayor gives good reasons therefor. Principal among them is the one that refers to the loop-hole which would permit the use of steam on the roads. The mayor thinks wisely that the bill should be so framed as to exclude everything else but electricity as the motive power. Elevated railroads, although admittedly great benefits, occasion considerable hardships to the residents on the streets through which they run; and if these can in any way be mitigated it is the duty of the projectors to attempt it. The many advantages of electricity for elevated railway purposes are well-known, and St. Louis' mayor is right in insisting upon its adoption.

ONE of our correspondents, "F.," draws attention to a point in connection with the interesting experiments of Mr. Mordey, details of which we recently published. The question is asked: If all conditions under which the motor was running, excepting that of speed, remained constant, why did not the work given out vary proportionately to the change in current? Our correspondent seems to think that the ratio ought to be a direct one, but this is by no means the case. The dynamic inductive energy of a current varies as the square of its intensity, and making due allowance for losses and possible saturation of the magnets even below the point at which the heavy current was employed, the figures obtained by Mr. Mordey are quite reasonable.

WE publish to-day a very interesting account of the development of electric lighting in California and on the Pacific Coast generally. It is evident that the field there is a good one, and is already being occupied. We believe that the California Electric Light Company claims that while electric lights were in use in factories, warehouses, etc., where power was easily available, theirs was the first station erected in this country for the sole purpose of renting out lights. But should its claim to priority be denied, the company is well content to know that it obtained its valuable franchise so easily as the article describes. By the way, speaking of priority brings to mind the claim of the Pacific Bell Telephone Company, of San Francisco, which maintains that it was the first company to establish a regular central telephone exchange.

IN another column we describe some telephonic apparatus which is of interest, as the instruments have been declared by the English courts to be no infringements on either the Bell or the Edison patents in England. The use of carbon in the transmitter has been obviated by employing alloys, such as the various bronzes, and by designing the apparatus in such a manner that no diaphragm is employed. In regard to the latter point, it will be remembered that many experts, among them Sir Wm. Thomson and Dr. John Hopkinson, were called to define the word "diaphragm," it being claimed that the "valve" used in the apparatus described has all the functions of a diaphragm. The use of metallic alloys instead of carbon for obtaining the microphonic effect permits the use of a stronger battery, which is, indeed, also required by the form of receiver employed. As the latter was purposely designed so as to be no infringement of Bell's instrument. it had to contain no permanent magnet, and hence the vibration of the tympan is effected by the attraction of an electro-magnet. Such an instrument is not so delicate as the magneto-telephone, and hence requires more battery power, but it has some advantages for that very reason. As it is not so sensitive, inductive effects have, in comparison, little influence upon it. Prof. Thompson, the old defender of Reis, has shown considerable ingenuity in the design of this apparatus, which embodies several novel points, upon which his success depends.

ONE has hardly recovered from the shock which the latest method of execution by electricity gives, when another, perhaps equally blood-curdling, application of electricity is suggested, happily (for him) by an unknown. It is nothing less than cremation by electricity. The inventor has thought out all the details—asbestos shroud, fire-brick frame, large copper head and foot plates, powerful dynamo, etc. The current would rapidly carbonize the corpse, which would occupy the position of the filament in the incandescent lamp, and the whole operation would be finished in a very short time. Fortunately the process is not carried on in a vacuum, or some of our incandescent lamp makers might claim an infringement upon their claims of a carbon conductor of high resistance, such as the human body would be rapidly converted into. If these applications of electricity continue to multiply, we shall, ten years hence, be able to make a round of most interesting sights. At one end of the city, machine-shops, elevators, pumps, etc., will be seen driven by electricity; at another point the electric railway; and then paying a visit to the jail, still on the same line of wire, one could observe the neat manner in which a criminal is dispatched by the electric shock. Turning from this cheering scene, one might next stroll into the "Electric Crematory," and by personally turning on the switch perform "the last sad rites" for a deceased friend. The practice of burial is behind the age, and this crematory has been a "long-felt want." Electricity is easily applied, and it now only remains to organize a big stock company to "push" the scheme. The inventor in the meantime remains in hiding.

HARDLY a week now passes but some new claimant for the telephone comes forward and relates with painful accuracy of detail how he talked through his telephone in 18—; and each one vies with the other in making the date a few years further back. But now, one of them comes forward, who having got his telephone, the nature of which is not clearly defined, to work as far back as 1851, has sent his proofs to ex-Senator Thurman with the modest request that his case be cited first, as it would at once dispose of the whole matter. If Mr. Cushman is correctly reported, he seems to be buoyed up with the hope that after having allowed his invention through which hundreds of people talked, to lie idle for 35 years, he may procure a patent upon the defeat of Mr. Bell. As this might lead others into the cherishing of hopes which can never be realized, we may state that even if Mr. Cushman's claim should be substantiated and Bell's patent declared void, the former could not obtain a patent, as his would constitute an abandoned invention. As the law stands, an inventor may work at his invention as long as he pleases, but if after two years' public use of this invention he fails to apply for a patent, he forfeits all rights to the same, and it becomes public property. If after two years' public use of the invention, another should obtain a patent for it, the original inventor may have the same declared void, but he himself could not obtain one as it would then come under the head of an "abandoned invention." Hence we would advise those who may be of similar mind with Mr. Cushman to give up the idea of obtaining an exclusive patent on the telephone. He may, as others have done, procure a patent upon *his* telephone, if it embodies features not heretofore known, but he will probably find himself in the same position as other inventors in the telephone field at present.

THE second report of the Brooklyn Commissioners of Electrical Subways is not only an interesting document, but a valuable one, and does great credit to the intelligence and prudence of its authors. The Commissioners have wisely determined to leave the work in the hands of the companies interested, and to gather experience from the results obtained by them. This is not only wise, but just, as it affords the electrical companies no ground for complaint at any subsequent failure. The board seems to hold a favorable opinion of the creosoted wood conduit which has been in use some months in Brooklyn, but, in accordance with its plans of experiment and tolerance, has permitted the laying of Dorsett and Richardson conduits. The intelligent examination of the cables laid in the creosoted wood conduit has already brought out a fact which may prove of the greatest value in the manufacture of lead-cased cables, and which will no doubt be acted upon. Under the course which the board is pursuing, a comparison will soon be possible of the relative advantages of air-tight and water-tight conduits and those in which the joints are not tight, and this question is becoming more and more important with the substitution of the destructive water-gas for coal-gas. Through the labors of this board a large number of wires have already been put underground, and the end of the summer will find many of Brooklyn's most incumbered streets comparatively clear, giving Brooklyn the largest underground mileage of wire of any city in the country. In view of such real and valuable services rendered, it is hardly right that thus far the Commissioners have received no compensation—a fact due to the loose manner in which the bill creating the board was framed. The lack of funds also prevents the employment of a competent inspector, and inspection work thus far has been done by the board itself. This obstacle to a faithful performance of duty should be removed at once, either by the companies' action in the matter according to the provisions of the bill, or by the State itself. Brooklyn is to be congratulated upon its advance in this matter, and we would strongly recommend the report to the attention of the New York Commission, which at present is unfortunately delayed in its action by the illness of one of its members. It is to be regretted that the report contains nothing in relation to electric light wires, but confines itself to telephone and telegraph lines. However, we are promised something about that for the future, and so must wait.

How to Wind the Magnets for Shunt, Series and Compound Machines—V.

BY CARL HERING.

Series Machines, Continued.

Having found, as described, that the cores are not too large or too small, and having found the proper value of the diameter of the wire from the allowable fall of potential and the ampère turns, and also guarded against heating, there remains only to provide that the last layer may be wound full, for the sake of appearance. This may be done in the case in which there are only a few turns more or less than what would be required to make it full, by simply winding it full and varying the speed slightly to compensate for this, if necessary. If, however, this difference is comparatively great, it is best to proceed as follows: Calculate the number of turns which would come on the last incomplete layer, wind that number of turns on the next to the last layer, fill up the remaining space with cardboard or the like to the thickness of one layer, and wind the last layer full over all. Or it may be done by winding the odd number of turns in a coarse or open spiral in the next to the last layer, and then cover this with a sheet of stiff cardboard, over which wind the last layer full. This, however, is not as good as the first method, as the cardboard, if not very stiff, is apt to cave in.

Having made all the necessary calculations for the diameter of the wire, it is best to check the result by determining the loss of potential for the wire selected, and to compare this with the allowable loss of potential. To do this, calculate the corrected mean length of one winding l_m, in inches. The resistance will then be:

$$R = \frac{50.13\ W\ l_m\ \theta}{d^2},$$

then from Ohm's law and this equation, the fall of potential in the whole magnet circuit will be:

$$v = \frac{50.13\ (a\ W)\ l_m\ \theta}{d^2},$$

which for $\theta = 0.0162$ and a temperature of 70° Fahr. becomes:

$$v = \frac{.875\ (a\ W)\ l_m}{d^2} = \frac{3.5\ (a\ W)\ l_m}{4\ d^2},$$

in which d is in mils and l_m is the corrected mean length in inches, of one winding.

If this gives a value much higher than that which was allowed, owing to the fact that the smaller gauge number wire nearest to the theoretical value obtained by the formula was taken, then if the difference is too great to be allowed, the next size larger may be taken, without necessitating any other change in dimensions.

If, when the machine is completed and is run on its proper circuit, it is desired to make the final accurate adjustment, it is only necessary to increase or diminish the speed by a few turns. This may be calculated from the final test by taking the speed proportional to the potential, provided the current strength was correct. If both the current and potential are slightly incorrect, alter the external resistance until the current is correct, then measure the potential and proceed as before. Care should be taken that the machine is warm thoughout before making the measurements. These final adjustments will, if the machine is properly calculated, be very slight in most cases, and can, therefore, generally be dispensed with.

If it is desired to regulate the machine to supply the same current with different potentials, that is, to run a varying number of arc lamps, place the adjustable resistance in multiple arc (as a shunt) with the magnet coils. This will shunt off some of the current from the magnets, and will enable one to regulate the magnetism and therefore adjust for different numbers of lamps.

If this is to be done, make the first test for both the maximum and minimum number of lamps, noting the ampère windings required in both cases. Calculate and complete the machine just as before from the larger of these two numbers of ampère turns. The current required in the magnets in the two cases will evidently be proportional to the ampère windings, for the number of windings is the same. This gives the current required in the magnets when the smallest number of lamps are run. Having calculated the resistance of the coils, it is easy to calculate what the adjustable resistance should be in order that the proper amount of current is shunted off by it, for the currents will be approximately inversely as the resistance.

If the normal current of the machine is a and the ampère turns required in the two extreme cases are $(a\ W)$ and $(a'\ W)$ then the current required in the magnets for the small load is approximately

$$a' = \frac{(a'\ W)}{(a\ W)}\ a,$$

and if R is the total resistance of the coils and r the minimum adjustable resistance for the small load, then

$$r = \frac{a'}{a - a'}\ R$$

The maximum adjustable resistance depends on whether the machine is to be regulated near its full load. If so, the maximum resistance can be calculated similarly to the above.

As the winding of the magnets is entirely independent of this resistance, a less troublesome and sufficiently accurate method of determining this resistance is to run the finished machine from its full load down to a short circuit, and, every time the load is reduced, adjusting any convenient resistance which shunts the magnets, so as to get the proper current in the external circuit. Measure these resistances for each case and calculate the adjustable resistance wire from this, taking care to proportion the diameter of the resistance wires so that they will not heat too much, and at the same time not require too much wire. The current going through the rheostat can be readily calculated for each case from the resistance of the magnets and the resistance of the shunt rheostat.

To illustrate the winding of a series machine according to the method described in this article, let us assume the following data:

An arc light, series-wound machine is to be built for a 10 ampère current at 1,000 volts, or about 20–23 lamps. Speed, 1,200 revolutions.

The armature was constructed and a trial frame built. Upon running the machine with four temporary coils of 250 windings each, it was found to require an exciting current of 40 ampères to bring the current of the machine up to 10 ampères and 1,000 + 2.5 per cent. of 1,000 = 1,025 volts. This gives $250 \times 4 \times 40 = 40{,}000 = (a\ W)$ as a measure of the magnetism.

The oval cast-iron cores were $8\frac{1}{2} \times 2\frac{1}{4}$ inches. The assumed thickness of coil is $\frac{1}{2}$ of $2\frac{1}{4}$, or about 1 inch. The periphery of core was found to be 18.8 inches. This gives from our formula,* the mean length of one winding 22.1 inches. From the formula for the diameter of the wire for the magnets,

$$d = \sqrt{\frac{.875\ (a\ W)\ l_m}{v}},$$

taking the allowable fall of potential at 25 volts, and assuming a factor of safety of 5 per cent., making $v = 95$ per cent. of 25 = 23.8 volts, the diameter will be,

$$d = 181 \text{ mils.}$$

This is about No. 5 B. & S. The heating will not be too great, for, from our constant for the density of current, a No. 9 wire will stand the current very well.

No. 5 wire was found to have an outside diameter of 220 mils. The length of core being 10 inches, there will be 45 windings per layer. As there must be 40,000 ampère windings, and being a series machine, and the current in the magnets being 10 ampères, there will be 4,000 windings, or 1,000 per magnet, or 22 layers, making a thickness of coil of $4\frac{1}{4}$ inches, as compared with our assumed thickness of 1 inch. This apparently absurd result shows that the magnets are very much too small, and that it would hardly be possible to finish the machine for such a large load. This might have been seen from the magnetic curve, but for the sake of illustration the calculations were also made.

The figures obtained will, however, not only show us what load this machine will carry, but will also enable us to calculate about what the size of the magnets should be for another machine which will give 1000 volts.

To determine the first, let $a\ b$, Fig. 2 (see ELECTRICAL WORLD, March 20), be the curve of magnetization for this machine, obtained as described in the first part of these articles. It will be seen from this curve that the magnets are saturated at about 18,000 ampère turns, and unless it is intended to over-saturate the cores to obtain greater steadiness in the current, this will be the maximum magnetism which ought to be used. Dropping perpendiculars from b and d, the distance $o\ e$ will represent 1,025 volts, and $o\ f$ the greatest number of volts which the machine will give if not over-saturated, provided that the required number of ampère windings will not make the coils too large. This distance $o\ f$, measured by the same scale, was found to be about 880 volts.

Calculate the diameter d again for 18,000 ampère turns, and an allowable loss of potential of 2.5 per cent. gives

$$d = 128.4 \text{ mils.}$$

This is almost exactly No. 8 B. & S. This will be found to be large enough not to heat too much. Its external diameter is about 158 mils. This gives 63 windings per layer, and about 7 layers, making a thickness of coil of 1.1 inches. This is about the assumed thickness of 1 inch, and shows that the machine is properly proportioned.

To check the result, calculate the fall of potential with a No. 8 wire and a thickness of 1.1 inch. This gives from our formula

$$v = \frac{.875\ (a\ W)\ l_m}{d^2} = 21.3 \text{ volts.}$$

This is inside of the limit of 22 volts, showing the calculations to be correct.

It is evident that another armature with more turns of wire might be used with the same frame, thus obtaining a higher potential with the same magnetization, or the same potential with less magnetization. This depends upon the nature of the armature used in the test, and belongs to the subject of armatures; it cannot therefore be discussed here. In this article it is assumed that the armature has been determined.

Let us now determine from the above test about what the size of the magnets should be for a new machine with the same armature, but giving the full potential of 1,025 volts, which is what it was originally intended for.

From the point d, Fig. 2, and from the size of the core, we can determine the saturation co-efficient, or the allowable density of magnetization for this particular quality of iron. As there are necessary for saturation 18,000 ampère turns, and as there are four magnets, if we divide one-fourth of this by the number of square inches in the cross section of the core, viz., 18, it will give the allowable density or saturation co-efficient. This gives 250 ampère windings per square inch. The cross-section of the new magnets must therefore be such that the density of magnetization, as determined from the new number of ampère turns, does not exceed 250 per square inch.

To determine the ampère turns of the new magnets, prolong the part of the curve $a\ d$, Fig. 2, until it intersects the line $b\ e$ at a point c; then $c\ e$ will represent the magnetism required for 1,025 volts with the old magnets, if they were not over-saturated, for $b\ e$ represents the magnetism required for 1,025 volts with the old machine in which the magnets are over-saturated.

Now from the point c it is seen that the distance $c\ e$ represents about 22,650 ampère turns. $d\ f$, the allowable magnetization for the small cores, is 18,000. Calling this $(a\ W'')$ and $c\ e$ the former, $(a\ W')$, while the required number of ampère windings is represented by $(a\ W)$, then, from the formula, the value of $(a\ W)$ is

$$a\ W = \sqrt[3]{(a\ W')^2\ (a\ W'')} - 21{,}000.$$

This makes the new cross section

$$\frac{21{,}000}{4 \times 250} = 21 \text{ square inches.}$$

The dimensions of the oval cores are, therefore, about 3×9 inches. The diameter of the wire will be, assuming a thickness of coil of about 1 inch.

$$d = 134 \text{ mils,}$$

or about No. 8 B. & S. This will not heat too much, as it is larger than that given by the allowable density of current. No. 8 wire has an outside diameter of about 158 mils, therefore, there will be 7 layers for a thickness of about 1 inch. This gives

$$\frac{21{,}000}{4 \times 7} = 75 \text{ turns per layer,}$$

making the new cores $75 \times .158 = 12$ inches long.

To check the result, calculate the fall of potential from the formula, which gives

$$v = 26 \text{ volts,}$$

or only a trifle higher than what was assumed at the outset. This results from having chosen the next smaller size wire to that given by the formula.

Suppose the finished machine gave only 990 volts and 10 ampères, then the speed should be increased to

$$\frac{1{,}200 \times 1{,}000}{990} = 1{,}212 \text{ revolutions.}$$

In conclusion it may be necessary to state that the above figures are not taken from an actual case, as no such machine was at the disposal of the writer at the time. They are merely to illustrate the method and are not to be taken as sizes to build a machine by, though at the same time they are not far from those of actual machines.

(TO BE CONTINUED.)

* ELECTRICAL WORLD, March 6, p. 106.

Photography by the Arc Light on an Incandescent Circuit.

Since the practice of illustrating and elucidating the text of daily newspapers by pictures has come into vogue, the availability of the electric light for photographic purposes has been taken advantage of to a large degree. Frequently these illustrations must be ready for the press within a few hours from the time the artist begins to make his sketch, and naturally every facility for rapid work must be at hand. In this race against time the electric light affords not a little help, and it forms indeed the principal factor of success.

Among the numerous departments of the New York *World*, that devoted to engraving is not the least interesting, and a recent visit there informed us as to new features in the enterprise of that vigorous journal. The process employed is that of photo-engraving on the zinc plate. The light for this purpose is furnished by an arc lamp of the focusing type, going up to about 4,000 candle-power, made by the Thomson-Houston Electric Company. This is placed in the same circuit with the Edison lamps, by which the building is lighted throughout; it is suspended from the ceiling upon a sliding frame so that it can be moved to any desirable distance from the sketch to be photographed and at such a height that the rays fall upon the sketch at an angle of between 30 and 45 degrees, the zone of maximum light in the arc lamp.

An ammeter and resistance coils are provided so that the current can be regulated at will for maintenance of a steady arc from 2,000 up to 4,000 candle-power. The whole is most admirably arranged, and evidently makes the obtaining of the negative entirely independent of daylight. So rapidly can the work be done that within one hour from the time the sketch leaves the artist's hand, the engraving is ready for the printer. Thus, Mr. McDougall, or any of the other artists associated with him on the staff of the *World*, may get the requisition for a sketch after dark, or may even be assigned to special work much later than the hour when most citizens of New York go to bed; and yet the facile pen of the artist will be so admirably seconded by the engraving processes carried on with the help of the electric light that, if need be, an incident occurring at midnight can be presented with graphic fidelity in the *World* as it lies on the breakfast table next

morning, awaiting the appearance of the household. Naturally, it does not often happen that expedition so great as this is required, but when the emergency arises as it will with any paper as enterprising as the *World*, it is met. One thing, however, deserves to be said. It is not to be expected that presses run at the rate at which the *World* flings off its editions can do very fine work on illustrations; but the paper is improving remarkably even in this respect, and may reasonably hope soon to give its cuts with the clearness of line and detail that they have at the minute when the negative of the sketch used is taken by the arc light.

Professor Thompson's Improved Valve Telephone.

The valve telephone of Prof. S. P. Thompson, which we described in our issue of May 23, 1885, has since that time undergone several improvements and changes which will make a description of it in its new form interesting, in view of the attention it has attracted. It will be remembered that the object in designing this telephone was to obviate all interference with either the Bell or Edison patents; how well or ill the inventor has succeeded we leave our readers to judge.

The illustration, Fig. 1, shows a general view of the subscriber's apparatus, consisting of two receivers, a call-bell, a transmitter of the "valve" pattern and an induction coil of special construction, which will be described later.

The valve transmitter has neither carbon button nor diaphragm, and is thus unlike the Edison or Blake, while the receiver has been declared by the English courts to be no infringement of the Bell patent in England.

Fig. 2 shows a transverse section of the latest form of transmitter. The sound waves are directed against a pear-shaped piece of carbon or metal which rests upon a split ring, as shown in Fig. 3. The three sections of the ring are connected by wires together, and thence to the primary on the induction coil, and the pear-shaped carbon to the other terminal of the primary. The soundwaves sent up the tube tend to raise the "pear-valve" from its seat, and thus the microphonic action takes place. Rubber washers

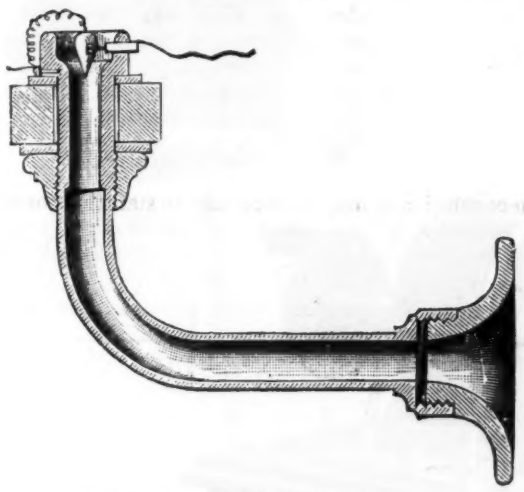


FIG. 2.—VALVE TRANSMITTER.

are provided to prevent accidental vibrations caused by movement at the base of the instrument.

Although the carbon microphone works well, says *La Lumière Electrique*, other materials have also given a good result, among them the silicon, selenium, phosphor, tellurium bronzes and other alloys.

The induction coil is wound in a peculiar manner and is designed to suppress the sparking caused by the interruption of the primary circuit, as well as the disagreeable sounds otherwise produced, when the transmitter receives a mechanical shock. The method consists in providing the core of the coil with two windings, in opposite directions, so that when both branches of the circuits are closed the core is demagnetized. A break in the current of one or the other branch causes the entire current to be sent into the other branch, and the core is magnetized without the generation of a spark from the self-induction. The transmitter is included in one of the branches, while the other includes a small compensating resistance of German silver wire, which serves to diminish the extra current in such a way as to equilibrate the two opposing currents.

The receiver is shown in Fig. 4 and is known as the "membrane receiver." It contains an electro-magnet *E*, opposite the poles of which is an armature consisting of a thin disc attached to a diaphraghm of several layers of gold-beaters' skin *M*. The disc armature is gilt or plated. Opposite its centre there projects the soft iron core of the electro-magnet *E*, and the other pole of the electro-magnet is arranged so as to cover a part of the coil and to concentrate the magnetic lines of force. The membrane is stretched over a ring of brass on the inside of the mouthpiece and can be easily removed.

The magnet of the receiver being an electro-magnet, the resistance of the line reduces the sensitiveness of the apparatus and weakens the current in the battery.

In order to obviate this defect without recourse to a large battery, Prof. Thompson has devised the arrangement shown in Fig. 5, in which *L* is the line, *R* the receiver, *Z Y* the battery, *T* the earth connection and *T P* a derived circuit or shunt which includes an electro-magnet *S* and connects the line and ground at a point beyond the battery. The electro-magnet *S* arrests all the feeble vibrations of the current which traverse the receiver, while at

FIG. 1.—THE VALVE TELEPHONE.

the same time it shunts a part of the main continuous current of the battery around the coil of the electro-magnet.

The transmitter with the induction coil is placed between the receiver *R* and earth *T*; the secondary wire of

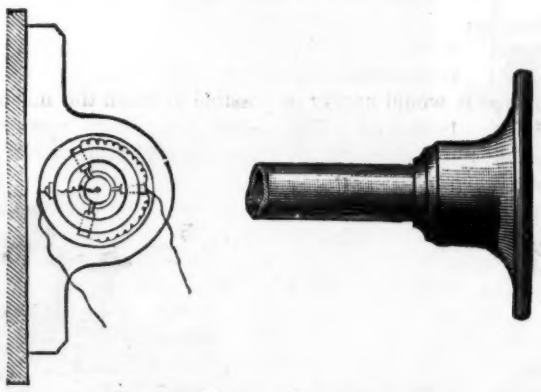


FIG. 3.—VALVE TRANSMITTER.

the induction coil completes the circuit between *R* and *T*, and the primary is connected to several cells (6 to 8 Leclanché) and through the transmitter. In the diagram, Fig. 5, *C* is the induction coil, *M* the transmitter and *W* the compensating resistance in the two branches of the primary circuit.

Destruction of the Toronto Telephone Exchange by Fire.

A special despatch from Toronto, Can., of April 1, tells the following remarkable story of the destruction of the

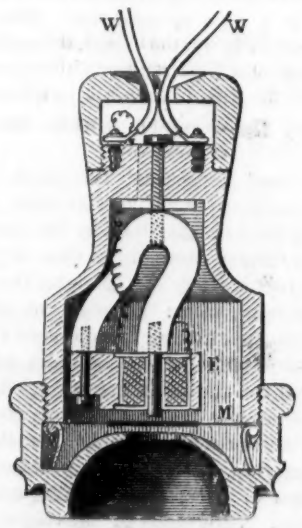


FIG. 4.—THE RECEIVER.

Bell Telephone Exchange there by fire: The *Mail* newspaper building, one of the handsomest structures in the city, the rebuilding of which has just been completed after its destruction by fire 18 months ago, was partially destroyed by fire this morning. The fire broke out in the Bell Telephone Exchange office about 4:30 o'clock. The telephone office was in the tower near the cupola, and this, acting on the fire like a huge chimney, soon enveloped the whole upper part of the front of the building in flames. Many of the occupants of the offices in the building are heavy losers. The total damage from fire and water will not fall far short of $40,000, which is pretty well covered by insurance. The origin of the fire is a mystery. That the fire occurred in the offices of the Bell Telephone Company is certain. Arthur Porter, the night telephone operator on duty, tells a remarkable story as to how he was assaulted by a big, burly man in the outer office; how he was knocked insensible, and that he remembered nothing till he came to his senses in the engine room of the building, whither he had been carried by some persons unknown. This story is pooh-poohed by many, but if true it looks as if the fire had been started by an incendiary. Yesterday was pay-day in the telephone office, and as this was known to a good many outsiders, it is possible that a robbery was attempted at first and arson added as an after-thought. Nearly all telephone communication in the city will be stopped for a month.

The injuries received by Arthur Porter, the young man who was slugged in the telephone office, are much more serious than at first supposed. Porter was in the office, and, hearing some one hammering at the safe in the operating room, he opened the door, and on going in was immediately caught by the throat by a heavy man. An accomplice then came to the assistance of the first, and the two men beat Porter fearfully about the head. They tied a handkerchief about his head, which it is thought they saturated with chloroform, took from him $40, his month's pay, and, after setting fire to the place, left him to his fate. Porter was rescued by Phillips, mechanical superintendent of the *Mail*, and did not recover consciousness for a long time after. The telephone company's property is damaged to the extent of $40,000, and the loss of revenue which will follow will be about half as much.

A later dispatch says: It has been discovered that an attempt was made to bore a couple of holes in the door of the safe in the Bell Telephone Exchange office in the Toronto *Mail* building, which was partially destroyed by an incendiary fire on the morning of the 1st inst. The holes,

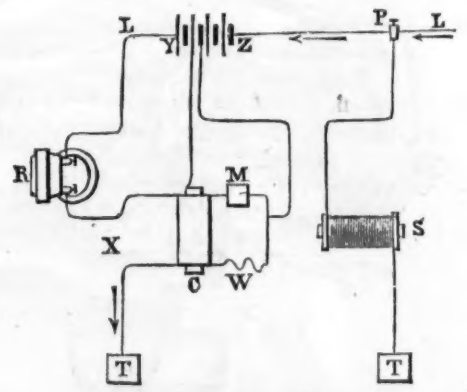


FIG. 5.—DIAGRAM OF CIRCUITS.

which were about an eighth of an inch in depth, were both close to the combination lock. This gives color to the statement of Night Operator Porter, that he was knocked down and beaten into insensibility by two men and robbed of $41. The theory of the origin of the fire now is that the burglars, thinking they had killed Porter, set fire to the building in order to cover their crime.

Application of Electricity to the Protection of Vineyards from Frost.

The damage which may be done in vineyards by frosts in spring is so serious that in some districts great care is taken to light fires as soon as the temperature falls dangerously near to freezing point, and to create clouds of smoke over the vineyard to prevent radiation as much as possible. In one district of France a telegraph inspector, Lestelle, has, as already noted in these columns, introduced an ingenious arrangement for rendering this smoke protection automatic, and applying it as speedily as possible in moments of danger. In the centre of the vineyard he places a mercurial thermometer. When this falls to 2 degrees above freezing point the mercury closes the circuit of a small galvanic battery. This sets in motion a commutator worked by clockwork, which sends the current from a small Ruhmkorff inductor through several circuits of wire in succession. Corresponding to each of these circuits is a heap of suitable combustibles laid ready and an ignition apparatus which is fired by the current. These heaps of fuel are placed some 40 metres apart, and are of course so composed that their ignition is certain, and that they will smoulder and give off a maximum of smoke. With this apparatus the costs and the unreliability of night watchmen in early spring are done away with, and also the delay attendant on lighting the fires. If a sudden frost comes on, the whole vineyard is enveloped in a few seconds in a cloud of smoke. The cost of the apparatus is given as $22 per hectare (equal to 2.47 acres), for which space seven fires are necessary to insure perfect protection.

REVIEWS OF NEW BOOKS.

PRECAUTIONS ON INTRODUCING THE ELECTRIC LIGHT. By Killingworth Hedges. London, E. & F. N. Spon. Price, $1.00.

This book contains a number of useful hints on the proper installation of electric lighting plants, and describes numerous safety devices designed by the author. The English electric light insurance regulations are also contained in the book.

THE ELECTRIC LIGHT IN WORKSHOPS. By Charles Lever Lon ion, 1886.

This pamphlet of twenty pages gives a short outline of the history of arc lighting and the manner in which it can be best applied in large establishments. The author's own lamp figures prominently.

ELECTRIC LIGHTING—ITS PRESENT CONDITION. By N. H. Schilling, Ph. D., Boston. Cupples, Upham & Co., 1886 55 pp. Price, 50 cents.

This is a translation from the German, and is a report that may give a partial account of the early condition of the electric light in Germany. but which certainly has no claim to be in any way authoritative for that country or any other. We need only mention that it was written by a "gasman" to account for some of the statements in it. There would seem to be no reason for the translation of this report into English, though it might serve to cheer some people up. The title is a ridiculous misnomer, and the contents are misleading and inaccurate. Much of the matter has reference to the state of affairs in 1884, and even that serves no useful purpose.

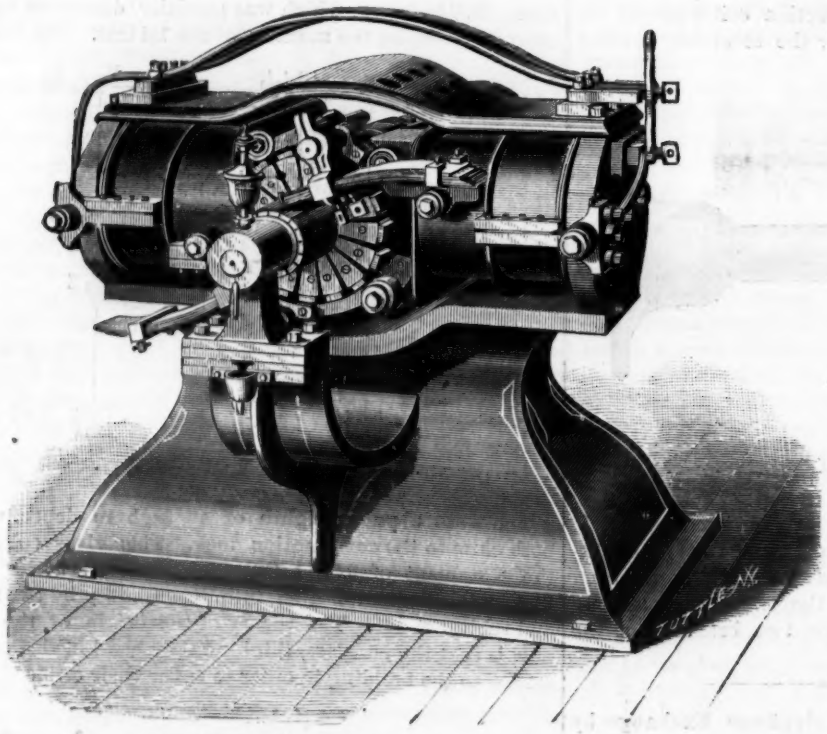
A New Plating Machine.

One of the principal applications of the dynamo-electric machine, and in which it became firmly established before its general employment as a medium for the production of the electric light, is that of electro-plating and electrotyping. In fact, without the dynamo the art would not now occupy the prominent position which it does, and which increases so much the beauty and value of many objects of daily use. In galvanoplastic operations the quality of work to be done necessitates suitable regulation and certain qualities of the current. Thus the electrotyper who has to produce his shells in a few hours must employ a current different from that which he uses when he has ornamental work in his tanks. The former must be done rapidly; the latter, in order to be done well, requires a slow, even deposition of metal.

Recently Mr. Hermann Bossier, of the Arnoux & Hochhausen Electric Co., of this city, has designed an electrotyping and plating machine, which possesses a number of novel features, and is so constructed that two circuits can be run from it, in such a way that both quick and slow work can be done by the same machine at one time.

The machine, which is shown in the accompanying illustration, has stout armature bars of solid copper, and no soldering is employed at the contact points. The field magnets are wound with wide ribbons of copper, and while shown in two sections on each core, they are directly connected so as to form one continuous winding. The bars which arch above the field magnets are of wrought iron, and they constitute the resistance in the shunt. Their number in circuit, and consequently the strength of current, can be varied by means of the switch at the right, which cuts out one or more as may be required. The strong current for quick work is taken off at the binding posts attached to the brushes, while that for slow work is taken off at the outer binding posts at the ends of the magnets. When it is desired to take off both currents at the same time, the iron bars are thrown out of circuit as required so that the baths connected to the binding posts at the end become the new resistance. This evidently utilizes the current which would be lost in heating the iron bars, and the proportions are chosen so as to make the fraction of the current so shunted suitable for slow work. This obviates the necessity of introducing resistances in circuit where one machine is employed on different kinds of work, and thus there is a gain in economy. The machine has been put in operation in various establishments in this city, where it has done excellent work.

FIG. 2.—READING TELESCOPE FOR GALVANOMETER.



NEW PLATING DYNAMO.

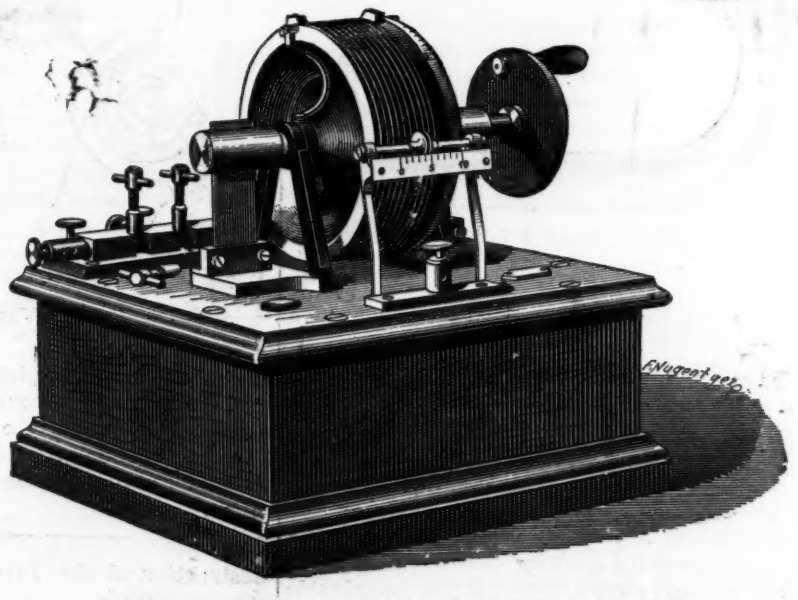


FIG. 1.—WHEATSTONE-KIRCHHOFF BRIDGE.

A Suit Against the Western Union for $2,000,000.

The Bankers and Merchants' Telegraph Company has brought a suit to recover $2,000,000 from the Western Union Company for damages done by the latter in cutting the wires of the former company in this city in July last. In speaking of the matter, Mr. Dwight Townsend, counsel for the company, says: "The action of the Western Union people was an outrage. A gang of their employés broke into the main office of the Bankers and Merchants' Company and cut the cables and circuits with axes. These circuits centred in the main operating room, and were connected with wires reaching from Ogdensburg to Washington, and from Boston to Omaha, embracing in extent over 40,000 miles of wire, and reaching every important point in that area. Thousands of messages were then in course of transmission, including social engagements and commercial relations, reaching in the aggregate hundreds of thousands of dollars. On the leased wires a rental of nearly $100,000 was paid by business firms. This was violently broken by the act of vandalism. The agents in this wholesale injury to innocent parties were armed with an order issued by Judge Donohue, which simply directed the receiver of the Bankers & Merchants' Company to deliver to the receiver of the Rapid Telegraph Company such property as belonged to the latter; but the Western Union saw an opportunity to destroy a rival. The aggressive company, however, was compelled by the court to give the wires up, but business firms who had leased private wires from the Bankers & Merchants' Company were compelled to go to the Western Union again and contract for a year at an increased rate. Just before this act the directors of the company had resolved upon a plan for reorganization, but capitalists afterward refused to enter into the plan, and certificates sold for 30 cents where they formerly brought 90 cents on the dollar. In fact, it would be scarcely possible for any one to realize the absolute wreck of a property in which the innocent but confiding public had invested upward of $6,000,000 in the belief that the right to compete for telegraphic business was as safe as the Constitution of the United States. Roscoe Conkling, R. G. Ingersoll and Edward Lauterbach have been retained by the receiver of the Bankers and Merchants' Company, and the case will come up shortly before Judge Barrett, and I have no doubt the full amount of damages asked for will be allowed."

Judge Dillon, A. J. Vanderpoel and G. J. Eggleston have been retained by the Western Union Company.

Electrical Instruments.

At the late Telegraph Conference held in Berlin an exhibition of electrical apparatus was organized in honor of the representatives present, and in it many fine instruments for electrical measurements were exhibited by Messrs. Hartman & Braun, of Frankfort-on-the-Main. Among them was the Wheatstone-Kirchoff bridge, shown in Fig. 1, which is constructed according to Professor Kohlrausch's designs. The measuring wire is 3 metres in length, but in order to avoid an unwieldy length of the instrument the wire is wound upon the cylinder as shown. As is usual in such instruments, the movable contact consists of a sliding roller; the stationary contact is effected by a brush consisting of 20 wires. The resistances for comparison (1, 10, 100, 1,000 Siemens units) are situated in the base of the instrument.

Another instrument shown was the reading telescope, illustrated in Fig. 2, by which the deflections of the galvanometer mirror can be read with great precision. It is so arranged that readings can be taken as close as 60 centimetres from the mirror. As the paper scale-strips pasted upon wood are known to be untrustworthy on account of the influence exerted upon them by the variation in the state of the weather, the instrument is provided with a glass scale with very exact rulings. The telescope is capable of motion in all planes, and the scale also can be arranged horizontal or vertical. Both the instruments just described have recently been imported by Messrs. Queen & Co., of Philadelphia.

Induction Coil in Telephones.

To the Editor of The Electrical World:

SIR: Will any of your numerous readers give me information in regard to how to put an induction coil in a telephone? What size coil should be used for the resistance in the primary and secondary coils?

Yours respectfully, J. H.

NEW YORK CITY.

ANSWER.—Lockwood's "Practical Information for Telephonists" will give our correspondent much useful information on this subject.—EDS. E. W.

The Schaefer Electric Lighting System.

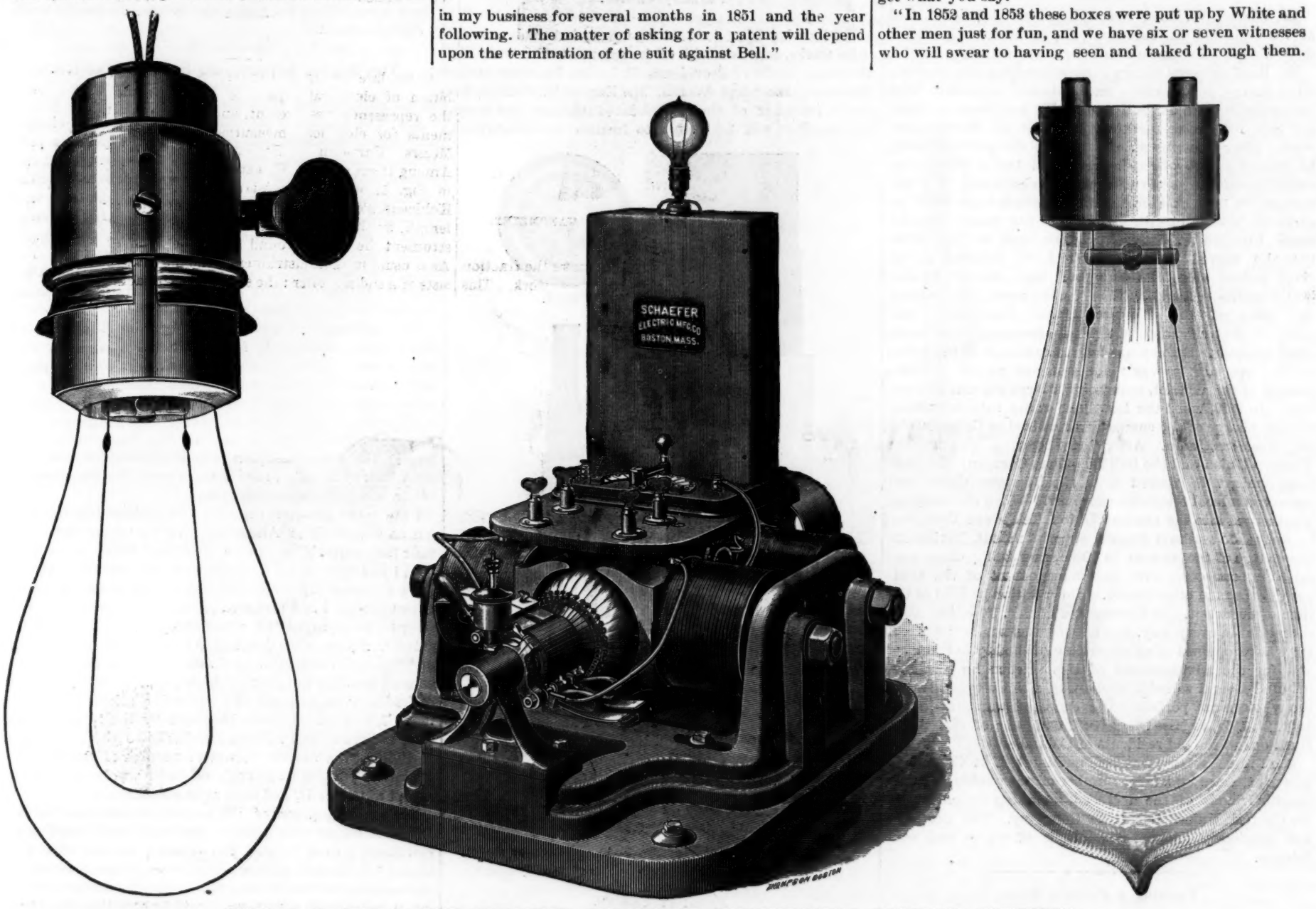
Among the incandescent light systems recently brought forward in the East is that of the Schaefer Electric Manufacturing Co., of Boston. Its electric an. Mr. Frederick Schaefer, has designed the dynamo, lamps and other necessaries, which we illustrate in the accompanying engravings.

Fig. 1 represents the dynamo, in which the Siemens armature is employed. The field consists of two pairs of electro-magnets, which are bolted to uprights on the base plate. There are two pairs of brushes on the commutator, which are adjustable independently of each other, so that either pair can be removed for readjustment when necessary, without stopping the current. While the dynamo is claimed to be self regulating, a regulator is provided which is placed on top of the machine, and is called into play when the speed of the machine varies on account of unsteadiness in the power.

The lamp employed in this system is shown in Figs. 2 and 3. It has a filament composed of carbonized silk. It fits into the socket shown in section in Fig. 5, and the switch is arranged to turn in either direction, for turning the current on or off. The lamp is firmly held in its socket, so that jarring does not loosen it nor affect the permanence of the contacts.

The system also comprises safety fusible cut-outs and circuit switches, one form of which is shown in Fig. 4. The circuit is closed through a double arm making contact between two springs. For heavy currents the double pole switch is employed, which breaks contact simultaneously on both sides of the circuit.

It is stated that several factories in Haverhill, Mass., and the railway depot at Concord, N. H., are lighted by this system.



[FIGS. 1, 2 AND 3.—THE SCHAEFER SYSTEM OF INCANDESCENT ELECTRIC LIGHTING.

Another Inventor of the Telephone.

The story now comes from Indianapolis that the telephone was invented in 1851. The particulars are given in the following special dispatch from Indianapolis of April 8:

An interview with Dr. Cushman, the inventor of the fire-alarm telegraph, and President of the American Cushman Telephone Company, gives an interesting contribution to the literature of telephone discoveries. Mr. Cushman is one of the parties in the suit against the Bell. He says:

"We wrote to the Hon. Allen G. Thurman that it seemed to us that if myself and those who would sustain my oath should first of all be sworn, our evidence would save the necessity of any one claiming to have invented the telephone since 1851. If we invented the telephone in 1851, as we claim and can prove, we certainly have priority. We have no patent. Our evidence will show without the shadow of a doubt that I used the telephone

FIG. 4.

in my business for several months in 1851 and the year following. The matter of asking for a patent will depend upon the termination of the suit against Bell."

His story of the discovery of the telephone is as follows:

"I made my discovery of the telephone in 1851, 16 miles west of Racine, Wis. I was engaged in building a tele-

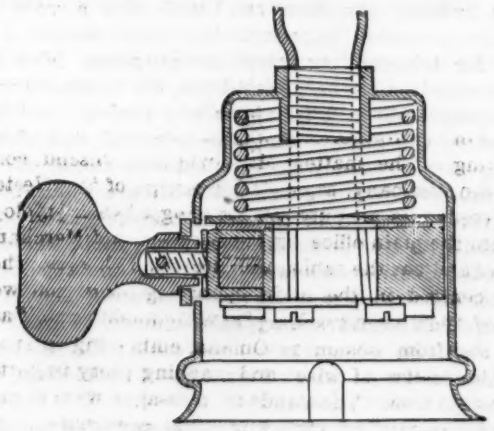


FIG. 5.

graph line from Racine to Beloit, Wis. I undertook to make a lightning arrester. Ezra Cornell and Mr. Speed asked me to get up a lightning arrester, and the one then got up is the father of all lightning arresters. While we were waiting for a thunderstorm we had one arrester with boxes, in a swamp, and the other we had put up where we had carried the line along, 16 miles further on. That day I chanced to put my ear to the box, and heard those frogs in that swamp faintly, but sufficiently clear to recognize their croaking. Others heard the same thing. Then we began experimenting over that 16 miles of wire. A Mr. White and myself communicated by tapping on the diaphragm in the box with a pencil, each answering the other in the same way. Next a whistle was tried, and the listener at the diaphragm got that. I took the thing apart when we went on with the line.

"I got Mr. White to make a number of magnets. My brother, William Pitt Cushman, and B. F. Blodgett, both of Akron, Ohio, were interested in my experiments. Four boxes were made, two for each end of the line, one to talk in and the other to listen at. We grounded a wire, and talked to each other back and forth two or three miles apart all one forenoon. We got other men at work with us to talk and listen at the boxes. There were six men working near by, all of whom tested the speaking boxes. Two of these men are alive, and I have their affidavits. I telephoned to them the words, as I remember, 'Stay where you are and we will bring your dinner to you,' and the answer came back, 'All right, Cushman. O. K. We get what you say.'

"In 1852 and 1853 these boxes were put up by White and other men just for fun, and we have six or seven witnesses who will swear to having seen and talked through them. Probably 200 other persons have heard these men talk about these facts. In 1854 my partner in the line building moved to Mount Pleasant, as it was then called. I fixed a loop so that we could talk together—I being at Racine and he six miles away—telephonically. We were all the time trying to make it work louder. You understand, the Bell patent rests upon the telephone that he made in 1875, and I made in 1851, and not upon the transmitter, which neither of us made. Mr. Blodgett is dead. I have the affidavit of his widow, now living in South Carolina, and she testifies that we used the instrument, crude though it was, from place to place and family to family. In 1854 I made a rope-walk at Racine for making wire rope for lightning rods. The walk was between 500 and 600 feet long, and we used telephone boxes for the men to converse through while at work. Here are affidavits from men to that effect.

"My brother, Joseph Cushman, said he would make boxes that would talk better, louder and clearer—and he did. Those he made were used all that summer. He took the same magnets that I had used in the other boxes. We contended that it was the diaphragm that was at fault, and we made it fluted, crooked, full of holes, and in all sorts of ways, never dreaming of making a short circuit. I invented the fire alarm telegraph, and in 1866, 1867 and

1868 lectured to the fire departments over the country. In my fire telegraph pamphlets you will see I claim a talking circuit in combination with the fire alarm, but the difficulty was to make them talk loud enough. I sold my fire-alarm patent, and Gamewell bought it of the parties to whom I sold it. You have heard of George B. Hicks, the inventor of the first telegraph repeater. He was a boy at Akron, Ohio, where I taught him telegraphy. He sold that invention to the Western Union for $100,000 in stock, probably worth $500,000 afterward when the stock was watered. Hicks tried to improve my telephone, but did not succeed in carrying it on any further than I had it, or than Mr. Bell had it in 1876. Bell and Cushman stood alike as to volume of voice and efficiency—nothing in favor of the Bell except appearance.

"The American Bell Telephone Company sent their attorney to see me. The consequence was I went to Boston and staid there four or five weeks at their expense. I made a contract with them on May 11, 1882, for three years. That contract was out last May. Since that time I have been gathering evidence of what I have told you, and since that time the American Cushman Company has been organized on the evidence I have accumulated."

Death of Mr. Charles W. Ross.

Mr. Charles W. Ross, the well-known electrician, died at his residence at Columbus, O., on March 25, after a short illness. The cause of his death was acute peritonitis.

Mr. Ross' personal history is an interesting one, showing what energy, perseverance and industry combined with intellectuality can do for a man. He was born on January 10th, 1848, being therefore just past his thirty-eighth year. After receiving an education in the public schools, he entered a store where he remained but a short time owing to a desire to learn the art of telegraphy. For this purpose, in 1864, he went to Indianapolis to learn what became the basis of his life's work. A few years' practice made him an expert telegrapher, and in this business he served the C., C. & I. C. Railroad at various points along its line, but was mainly located in Columbus. Leaving that employment, he entered the office of the Western Union Telegraph Company in that city, and two years afterwards was made chief operator. Some years later, in addition to his duties as chief operator, he was made assistant to the superintendent of the district, embracing a large amount of territory. In 1879, when the telephone came into operation, he took charge of the company organized at Columbus by the Western Union. After the litigation between the Western Union and the Bell Telephone Company had been compromised he retired from the Western Union and organized a local telephone company. When the company was merged into the Central Union Telephone Company he was made assistant general superintendent, having entire charge of the system in Ohio, and being often consulted in connection with the management of the company's affairs in other States. This position he held at the time of his death. In his business life Mr. Ross has been successful in every way, and he was universally respected. He was recognized as an electrician of the highest ability, and for the advancement of this science he had contributed several valuable appliances, which served to make the whole more perfect. The deceased was married on Sept. 21, 1875, to Miss Clara Huff, daughter of Mr. A. D. Huff, one of the old residents of Columbus.

The funeral service was held on March 27 at Columbus. It was attended by a large number of telephonic and telegraphic friends of the deceased, including the officers of the Central Union Telephone Company. The company had previously adopted resolutions of regret and condolence.

Tapping a Private Wire.

A remarkable incident is reported from St. Louis in connection with the great railroad strike. A dispatch of April 4 from that city says: Frank P. McKeighan, a telegraph operator, was arrested to-day by order of the Chief of Police, and up to to-night the cause of the arrest was a great mystery to his friends, which a statement he made to-night clears up.

About a week ago Mr. Furlong, head of the detective service of the Gould system, reported at Police Headquarters that a private wire between Mr. Hoxie's residence and the Gould offices down town was being tapped by some one, presumably in the interests of the strikers, and he expected to make an arrest soon. He might need the assistance of the Police Department, which was promised.

Friday night last three policemen were given him, and, with ten of his own private detectives, they made up a force equal for the capture of a whole army of unarmed strikers. The policemen were informed that several men were to be arrested in a room at No. 2327 Market street, and that one of them, a lame man, was to be allowed to slip off on the way to the police station. The grand raid on 2327 Market street was made and only two persons were found, one a lady at work on a sewing-machine on the second floor, and the other a lame man, in the front room of the third story, in which were also found two or three telegraph instruments. The woman was not wanted and the lame man was immediately released per instructions. The police had not been informed what was wanted with the men who were supposed to be with the lame man, and asked no questions, but made a report to the police department. Major Harrigan, Chief of Police, wanted to know more about the affair and to-night he caused the arrest of the lame man, who proved to be Frank P. McKeighan, telegraph operator.

McKeighan's story is that Furlong engaged him to join the order of Knights of Labor and learn their secrets and to get the leaders into a trap. He was to tap the wire between Hoxie's residence and the Gould offices here and run the wire into a room he had engaged on Market street. Martin Irons, A. C. Coughlin and A. M. Sullivan, Master Workmen of the three District Assemblies, 101, 17 and 63, were to be lured into this room and then the raid was to be made and they were to be captured and the evidence of the tapped wire discovered. McKeighan became a Knight of Labor, became intimate with the three Master Workmen and thought he had everything fixed. A bright light in the front room was to be the signal for Furlong. Last Friday night Furlong saw the bright light and the raid was made only to find McKeighan there. It was a blunder of Furlong. The light he saw was in the second story, occupied by the lady who runs the boarding-house, and not in McKeighan's room, which was on the third floor.

Faraday Cables.

The Faraday Electric Cable Company has made a lease of its works, together with all its patents, to the American Electrical Works of Providence, R. I. The President of the American Electrical Works, Mr. Eugene F. Phillips, becomes manager of the consolidated business, and states that no effort will be spared to furnish the telegraphic, telephonic and electric lighting fraternity with cables especially suited to their various needs. Before the lease was consummated the Faraday cable was subjected to the most rigid scrutiny and the results were more than satisfactory. The makers of the Faraday cable claim for it an extremely high insulation combined with a very low specific inductive capacity, the two requisites of a cable for telegraph or telephone purposes. Now that the consolidation has been completed, the manufacture of the Faraday cable will be vigorously pushed, and it is believed by the makers that the telegraph and electric lighting people can now be supplied with cables of very high insulating power combined with great durability, while those engaged in the telephone business may be furnished with that great desideratum, a cable absolutely free from induction and cross-talk. The main points in the cable are already familiar to electricians. The accompanying illustrations show it as now made. Figs. 1 and 2 are the 100-conductor telephone cable; Fig. 3 the 20-conductor telegraph cable; Figs. 4 and 5 the electric light cable.

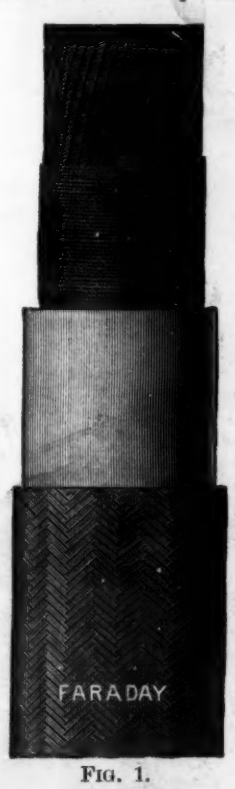


FIG. 1.

FIG. 3.

FIG. 4.

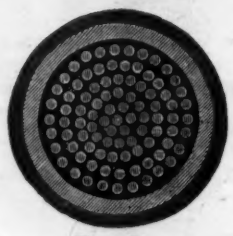


FIG. 2.

FIG. 5.

FARADAY CABLES.

"25c. Collect."—Young city gent engaged to a Santa Rosa belle; happy day, 31st ult. Somebody fickle. "All is over between us." The 31st arrives, and he sends her a telegram: "Please accept my congratulations on our mutual escape." She replies: "Many thanks. Had forgotten all about it. 25c. col."—*California Maverick.*

The Efficiency of Electric Motors—A Problem.

To the Editor of the Electrical World:

SIR: In my letter under the heading "Can the Efficiency of a Motor be as High as that of a Generator?" in your issue of March 27, the efficiency given as 60 per cent. should read 69 per cent.

I take the opportunity to suggest, to electricians who like to investigate such matters, that they will find food for interesting thought in studying out the reason why the efficiency of Mr. Mordey's motor should vary between the wide limits of 26 and 69 per cent., when all the conditions except the current flowing remained constant. If the magnetic field, the counter E. M. F., the speed, the difference of potential at the terminals of the motor and the circuit all remain practically unchanged, and there is no distortion of the magnetic field, nor displacement of the brushes, then why does not the work given out by the motor increase in proportion to the current supplied to it? The heating of the conductors by the increased current has nothing to do with it, for the heat generated in the circuit increases as C^2R, which would *lessen* the efficiency with stronger currents, whereas the table on page 73 shows that by increasing the current 4.31 times (from 29 to 125 ampères) the motor gave out 11.7 times as much work, the efficiency being (2.7) nearly three times as high. There is something for young electricians to puzzle over.

NEW YORK CITY. F.

The Hughes Experiments in Self-Induction.

To the Editor of The Electrical World:

SIR: The portion of the community engaged in electrical pursuits certainly appreciates your enterprise in publishing from advance copy the very interesting and important address of Prof. Hughes, recently delivered before the English Society of Telegraph Engineers, giving, as it does, facts, the result of careful experiments, of great value to nearly every branch of electrical development. While Prof. Hughes is not new to the exposition of electrical science and its experimental facts, it will doubtless receive ready assent that his latest efforts are the most valuable and interesting.

The resulting facts made public by him illustrate one thing pretty clearly. It is the difference of spirit and motive with which scientific experimenters in England and other parts of Europe undertake their work as compared with those of the United States. Here it is generally practical utility and the endeavor to make the subject pay through the Patent Office. There it is more largely the amateur spirit which partakes of true science, looking mainly to the general reward of reputation, honor, and philosophic recognition.

I am sorry to admit that the comparison touches myself as well as other Americans, for no sooner did I see your first editorial notice of Professor Hughes' address and the experiments he describes, than I immediately turned among my samples to find an old model of a conductor which I had prepared in the autumn of 1883 for the purpose of urging its adoption upon the Postal Telegraph Company, then desiring to lay in Washington, D. C., underground conductors, embracing some heavy ones to be used for their automatic telegraphy, and in which they desired to avoid as much as possible the effects of induction. I had reasoned out theoretically the same conclusions arrived at by Professor Hughes as to the advantage of dividing the current between a number of parallel conductors, separated from each other in whole or in part, except at the ends, and used as one conductor.

The conducting core of my model was composed as follows: A copper wire lightly insulated with winding of paraffined cotton formed the centre; around this was placed four strands of bare copper wire of the same size as the centre wire, No. 18, Am. G. Each strand was made of two wires twisted together. It will be seen that these four strands did not fully occupy all the space around the centre insulated wire so as to touch each other laterally at every point, but that the random contacts between them will be at uncertain intervals, and that a strand of two wires always leaves spaces or depressions at the steps of the twists which would largely separate the wires of any two strands even though in general contact, side by side.

With such a conductor, composed, as in this case, of nine wires, and then insulated as a whole, I reasoned that I could accomplish the results now so beautifully declared by the experiments of Prof. Hughes. Unfortunately for my theories and propositions, which were urged before Mr. E. A. Leslie, then one of the electricians of the Postal Company, the appreciation was not cordial or satisfactory to me, and the Postal Company did not care to order any of my conductors for their Washington line, so that my model was returned to the pile of samples in my office and dismissed from my thought until the announcement of Prof. Hughes' experiments.

I do not mention this to claim a share of the honor given to Prof. Hughes, for to him belongs all the credit of giving to the world a very useful discovery, but I think it worthy of remark to illustrate the fact that science has votaries who will work for the love of it, and others who only benefit the world with scientific knowledge when it comes in some practical form of utility designed primarily to benefit its possessor or theorist. SIDNEY F. SHELBOURNE.

NEW YORK CITY, March 10, 1886.

The Allis Reynolds-Corliss Engine.

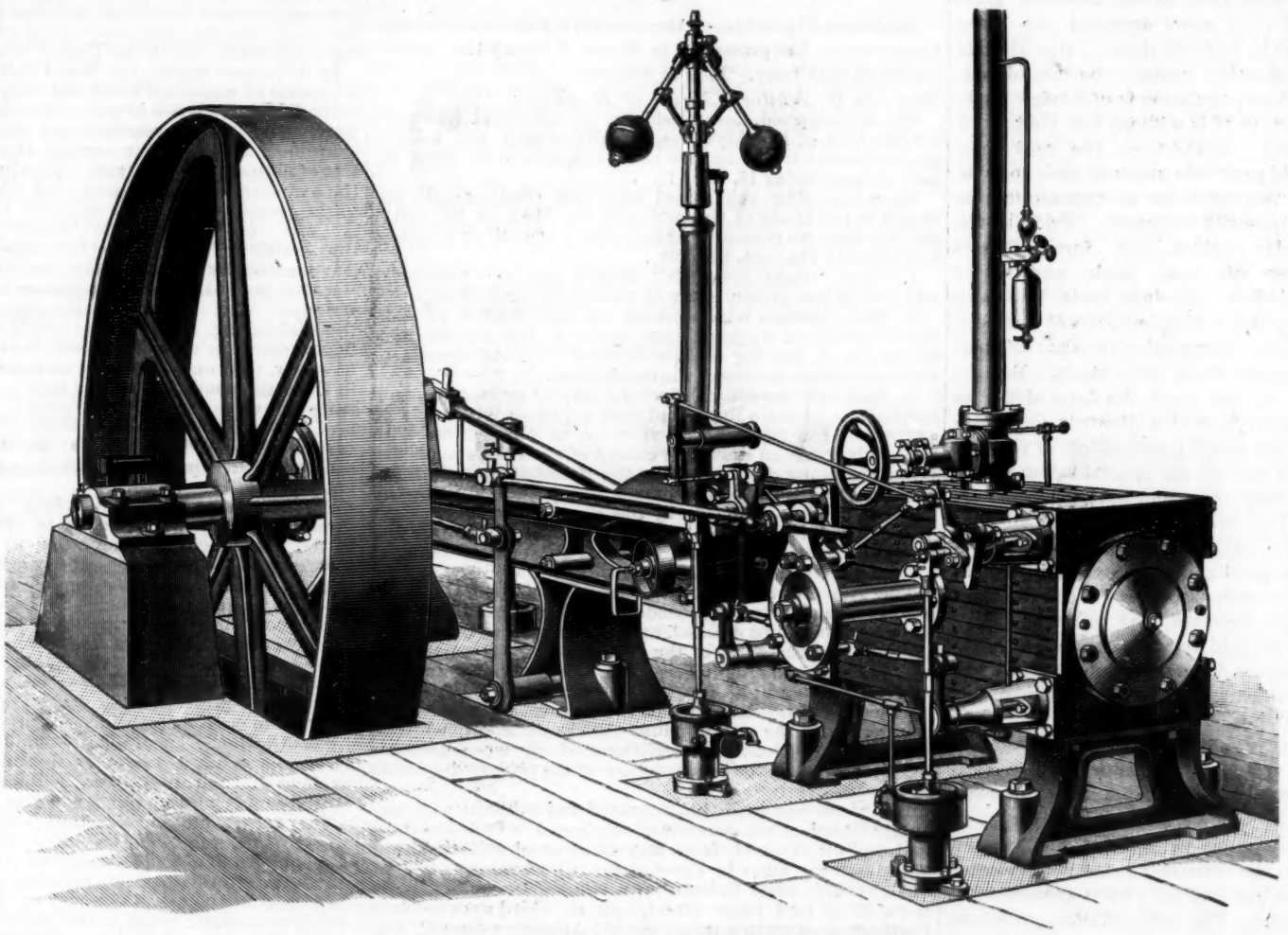
The discussion of the question of steam power at the late Convention in Baltimore showed that a decided difference of opinion existed in regard to the relative merits of high and slow-speed engines. Without entering again upon the subject here, it may be remarked that the advocates of good slow-speed engines were not few; and certain it is that as satisfactory economy has been attained from some of them as with the high-speed. Indeed, the economy of some engines of the Corliss type has never been surpassed, and they stand to-day as models of excellence.

Numerous modifications of the original Corliss engine have been made, among them the Reynolds-Corliss, built by Messrs. E. P. Allis & Co., of Milwaukee, Wis. This engine, which is illustrated in the accompanying engraving, embodies a number of improvements; and its most distinct features are embraced in the design and construction of the valve gear. The valves themselves have very large wearing surfaces, thus effectually preventing the cutting and wearing of the valves and valve seats, which will occur where small wearing surfaces are exposed to continuous pressure and motion. The valves are simple cast-iron blocks of cylindrical form, and are so arranged that they require no springs to hold them in place; they rest in their seats perfectly free to move, and entirely unhampered by yokes or other contrivances; they are driven from one end by simple T-heads, formed on the inner ends of the valve stems, so that there is nothing inside of the steam chests but the valves themselves, and each one composed of *one* piece of iron only; by taking off the back bonnets (by removing four tap-bolts), any one of the valves can be taken out without disturbing or altering a single adjustment of the valve-gear. This allows of convenient and rapid examination of the valve-gear without disturbing any other parts of the engine.

The wrist-plate, to drive the four valves, is mounted upon a large, substantial bearing, bolted to the side of the cylinder, and drives the valves by means of four small connecting rods The exhaust valves are at all times positively connected with the wrist-plate, and the steam valves are always opened by positive connection, but are closed by means of the vacuum dash-pots. The steel catches for opening and liberating the steam valves are made of hardened steel and arranged so as to give eight wearing surfaces on each piece, without re-dressing or re-tempering. This is a novel and valuable feature, and a very important one where engines are located in places out of the reach of a machine-shop. The liberation of the valves for cutting off steam is effected by means of hardened steel blocks which are controlled by the regulator, and to the peculiarities of this device is due the remarkable uniformity of speed.

As regards the general features of the engine, it will be seen that the frame or bed is made in two pieces, which are accurately fitted and securely bolted together—one piece containing the slides and forming the front cylinder-head, the other portion being cast solid with the main pillow-block. The pillow-block is very heavy and strong, having a broad bearing on the foundation and secured by heavy anchor bolts, the same as the cylinder end; it is also provided with effective means for taking up wear in the main journal. At the centre of the bed, and directly under the slides, is another support, which gives additional solidity to the frame, and renders any springing or vibration impossible.

The engines of this company are finished in the best style, and tests made upon them have shown very high economy.



THE ALLIS REYNOLDS-CORLISS ENGINE.

Navy Bureaus.—It is proposed to consolidate certain of the bureaus in the Navy Department. Under the present system, one bureau supplies electric lights and lights for general illuminating purposes; another supplies, to the same ship, electric search lights; and a third supplies oil and lights for the engine and fire rooms.

Electric Lighting on the Pacific Coast.

One of the first local companies organized in this country for the purpose of engaging in the business of electric lighting from a central station was the California Electric Light Company, of San Francisco. It adopted the Brush system; was incorporated as early as June, 1879; at once set about erecting a central depot, and by September of the same year was furnishing electric lights to subscribers about the city at the good round rental of $10 a week for each light, burning from dark until midnight. Since then, however, the price has been reduced half a dozen different times. The rate is now $3 a week, and will probably be still further reduced. The company has no competitors in San Francisco, and it aims to make the rates so low as to discourage other companies from entering the field.

In addition to San Francisco, the company has the agency for all the rest of the Pacific coast, and has established lighting stations at other points. The Los Angeles and the San Jose stations are very fine ones, both cities being entirely lighted by electricity. It was under rather peculiar circumstances that the license of the Brush system for the Pacific coast was obtained. The Telegraph Supply Company of Cleveland sent out men to San Francisco to wire one or two new hotels, and put in annunciators, call bells, etc. The job was profitable, and by showing how much they had made in so short a time, they were able to get $5,000 from a gentleman who had made money in the coal business, for a license to use and sell their goods on the Pacific coast. The purchaser, however, obtained a guarantee that he was to have, free of charge, a similar right to any other inventions the party of the first part might become possessed of during the life of the patents mentioned in the contract. Nobody, of course, at that time had the least idea that this same party of the first part would blossom out into the Brush Electric Company. When it did, however, it carried out its agreement, and so the license for the Brush system for the Pacific Coast virtually cost nothing; the company purchased it from the coal dealer, and was not required to hand over any of its stock to the parent concern in Cleveland.

The history of the company will be interesting to Eastern electricians. It was a pioneer, and it had to learn many things by experience. After having run 5 months and reached a capacity of 50 lights (the limit of the station) the works were destroyed by fire on April 24, 1880. There being no insurance, there were no "adjusters" to waste time over, and the company immediately secured another site upon a five years' lease, and within thirty days had a brick station erected and all the apparatus repaired and again running. Within two years the business of the company had grown beyond the capacity of their works, when they moved to the present site, this time purchasing the property and erecting a plant with a capacity of 400 lights, which in turn became too small, and they were necessitated to purchase the adjoining property and have just erected thereon a substantial brick building with a smoke-stack 150 feet high, 6 feet inside diameter. Their present building is 85 by 130 feet and two stories high, and is situated at Nos. 222 to 232 Jessie street. It has two Corliss engines of a capacity of 500 horse-power each, which the company are very proud of. They were made in San Francisco and weigh 83 tons. Each driving wheel weighs 16 tons. The engines are connected to a line of steel shafting in such a manner that one or both engines can be run as may be desired. This shafting revolves at the rate of 300 revolutions a minute, and is belted direct to the dynamos in such a manner that any machine can be disconnected without disturbing the rest. This is accomplished by a unique device, which is highly spoken of. There is no friction or wearing surface. When the disc is telescoped, the machine starts; when thrown out, it stops. The action is positive, and it is claimed to be the most perfect device invented for stopping and starting electric light machines. Mr. Roe, the secretary and manager, promises to be at Detroit in August, and to bring a model. The station in other particulars is equipped with apparently every possible device for convenience and safety, the switch-board being so arranged that any circuit can be changed to any machine without making a perceptible flicker in the lights, and throughout the building are 6 fire-hose attachments connected to the city water mains, by which a stream of water can be turned on any part of the building with 65 pounds pressure at a moment's notice.

San Francisco is about the only city in America of its size that is not considerably lighted by electricity. It rents only 56 lights for public purposes; but the company now furnishes 468 lights to subscribers, and the number is constantly increasing. Mr. Roe says that the business has heretofore outgrown the capacity very often, but that the present enlargement gives a plant equal to the needs of San Francisco for many years to come. With the old and new stations, the company has a capacity of 1,400 lights. The paid-in capital of the company is $275,000. Mr. George H. Roe is a large stockholder, and has filled the offices of secretary and manager ever since the incorporation. His brother, Mr. Edward A. Roe, is foreman of the works. Mr. James R. Petrie has charge of the dynamos and Mr. Geo. R. Longdon of the arc lamps.

The Los Angeles Electric Light Company was established in 1882 by Mr. Chas. H. Howland, who has ever since acted as secretary and manager. The capital is $150,000. Mr. Howland secured a contract for two years, from Jan. 1, 1883, for lighting a portion of Los Angeles by 7 masts with three Brush lights of 3,000 candle-power on each mast. The price was $1,000 each a year. The gas company's bid was $6,985 for 165 gas lamps, or $15 less than the Electric Light bid; but Los Angeles is a progressive city, and preferred the electric light. The masts were 150 feet in height, and made of Puget Sound pine, and the lighting gave so much satisfaction that when the two years had expired the contract was not only renewed at the same rate for an additional two years, but more masts were ordered. There are now in Los Angeles 15 masts of three lights and 2 masts of four lights, besides 19 sixty-feet masts, each carrying one lamp for which the city pays $19,000 a year. The number of private lights is 200. The company pays a regular monthly dividend of 6c. a share—par value $10. Coal costs $12 a ton at Los Angeles. Oil was struck in that vicinity some time ago, however, and the company finds it a saving of 30 per cent. in the item of fuel to burn the oil instead of coal. Mr. James Warren is superintendent of the Works.

The San Jose Brush station is said to have a capacity of about 150 arc, and the city uses the lights on towers.

The Pacific Coast Electric Construction Company, using the Keith system, has two or three sub-companies and plants in Oregon, Washington Territory, and California, and has orders on hand for all the apparatus it is finishing at its works in San Francisco. The Thomson-Houston Company is making a vigorous push for business on the Pacific coast. It has fine stations at Oakland and Sacramento; and an endeavor has been made, so far without success, to get street privileges in San Francisco for both

the Keith and the Thomson-Houston systems. Meantime a Jenney company has just succeeded in securing the contract for lighting Alameda, one of the suburbs of San Francisco, about 11 miles out, and there is also a Jenney plant in operation at Stockton.

Some isolated Edison plants serve to illuminate the coast. One plant of 1,050 lights is in the great sugar refinery of of Spreckels. The "Santa Rosa," of the Pacific Coast Steamship Company's line, and the Honolulu steamers also have the Edison system. Mr. Ladd, of the Pacific Bell Telephone Company, is the agent, and the work on the installations has been done by the California Electrical Works.

Copyrighted Cable Dispatches.

So accustomed has the public become to the regular appearance of columns of telegraphic news in the daily papers, that it fails to recognize how largely the papers depend on the wires for their contents. If either the domestic or the foreign supply of intelligence were cut off, the papers would suffer most seriously in interest and usefulness; and it is this fact, for example, that renders the Associated Press privilege so valuable. At the present time, a fight is being carried on between the Western Union Company and some of the Kansas papers, because the latter, in their desire to have the fullest news from points beyond their own local scrutiny, have availed themselves of the service of opposition press agencies, in spite of the exclusive nature of the contract upon which the company alone agrees to handle news. It is evident that both parties to the contest are fully aware of the vital nature of the points raised.

Owing to the competition that exists between rival telegraph companies and rival news agencies. the home news service appears now to be fairly done. But that is by no means the only part of the matter to be considered. A large portion of American population is of foreign birth, and there is no single portion of it without ties that bind it closely to the Old World. Hence, from the very first, American papers have had to devote much of their space to European news; and as the facilities of communication become multiplied, the quantity increases. Prior to the laying of the Atlantic cables, the foreign news given by the journals of New York and other cities was chiefly confined to clippings from European contemporaries. The regular correspondent had not been invented, and the irregular correspondent was not so trustworthy as a full file of papers from Fleet street. But the laying of the cables put an end to all the fierce struggles for priority of publication, in which Bennett and Raymond and Greeley and the other great editors of the last generation depended for success on special locomotives, fast pigeons, relays of posthorses, and smart pilot boats. American newspaper editors were the quickest of all men to discover the use of the cables, and what was then regarded as their reckless prodigality of expenditure was noted complacently in the early reports of the cable companies. In a few years, however, the principle of co-operative service was applied to this department of news-gathering not less than to the domestic; and now, in addition, the regular correspondent, who had been accustomed to mail his matter, is cabling it.

All this is in the line of evolution and of improvement, but the system has had very serious defects. In America, the ubiquitious interviewer has been able to get directly from the leading men in finance, politics, commerce, art or religion, their latest opinions as well as the freshest news. In Europe, on the contrary, the information for the American public has generally been gathered *à la chiffonnier*, at second-hand. The news-collecting methods followed in Europe, even by the well-known agencies of Reuter and Wolff, have never compared for system, thoroughness and efficiency with those in vogue here; and hence the news transmitted one day at great expense has been flatly contradicted the next, or has had such a twist of meaning given it as to mislead utterly all who read it in print. It is notorious that Irish feeling has more than once been aroused to bitterness by reports coming here from Ireland via London, for which it afterward was learned there was no foundation; and other objections have often been made again on the ground that the scope of the news and the area from which it is obtained are both too limited for an American public mixed of all nationalities, and, through its general education, taking the keenest interest in subjects the most varied. In a word, while the quantity of news sent across the Atlantic has vastly increased, the quality has remained about where it stood at the start, and the cable has but too often been a gossiping old woman, full of wild rumors and the absurdest tales.

This weakness in the prevailing system has lately arrested the attention of Mr. Allan Thorndike Rice, the brilliant young editor of the *North American Review*, who, from his wide acquaintance in European circles and his familiarity with foreign affairs, was often led to notice the transmission of news which, had it come direct from some authorized source, would have worn a very different face. Mr. Rice, with a quickness of decision that is said to be characteristic, made up his mind that the way to get the best work out of the cable was to report accurately and with direct authority, from the prominent and influential men of Europe, the latest news or the views that are simply news in the making. He has now formed a newspaper syndicate, and has himself gone to Europe to superintend the work there. Among the papers already in the syndicate are the New York *Tribune*, Boston *Globe*, Chicago *News*, St. Louis *Republican*, Pittsburgh *Dispatch*, Toronto *Globe* and others. These papers each receive several thousand words per week, and the matter is sent either signed or authenticated. The syndicate has in this manner already published signed cable messages from Worth, the great Parisian *modist*; Parnell, Chamberlain, Earl Grey, Huxley, Henri Rochefort, Prince Krapotkine, Michael Davitt, Louise Michel and others equally prominent; and has also had very important interviews, one being with De Lesseps, on the Panama Canal, and certified by De Lesseps as being perfectly correct. These "copyrighted cable dispatches" are published under the title of the North American Cable News Company.

It must be clear to all that this is an admirable system, yielding good results and capable of indefinite expansion. The readers of the papers in the syndicate get their news in accurate shape, and instead of being informed that this or the other personage is understood to think or to have said something, they have the utterances direct from the fountain-head, clear, explicit, authoritative, and probably all the fuller because they will reach an impartial public beyond sea, whose opinions are more and more having an important reflex action on the thought of Europe. Altogether, the new departure is one of great promise, from which only desirable effects may be expected. If Mr. Rice does nothing else, he has made a most commendable attempt to put the cables to their highest use.

Report on Underground Wires in Brooklyn.

Chairman Plympton, of the Brooklyn Electrical Subway Commission, has presented to Mayor Whitney the second report of that body. It is as follows:

Hon. D. D. Whitney, Mayor of Brooklyn:

The undersigned, Commissioners of Electrical Subways for the City of Brooklyn, respectfully submit the following statement in the nature of a supplement to their report of September 15, 1885:

Since that date the Board has been continuously engaged in the study of the problems involved in its duty, but has seen no reason to change the conclusions which it had already reached, namely:

1. That "solid conduits" should not be extensively adopted in the present state of knowledge and experience.

2. That conduits which permit the easy change of conductors without frequent disturbance of the streets may be employed, leaving the questions of electrical details to the companies operating the conductors.

3. That low tension conductors may be grouped in such conduits as to main lines, and that overhead wires may be permitted for terminal distribution in connection with such subterranean lines, the extent of such overhead distribution being determined by the Board at the minimum consistent with reasonable practicability and subject at all times to further reduction by the Board when such shall appear feasible; and the location and nature of supporting poles or structures for such terminal distribution being at all times within the control of the Board.

The New York and New Jersey Telephone Company having proposed to lay a conduit which appeared to satisfy the conditions thus defined, and offering to give room in the same for the wires of the Police and Fire Departments; and the Western Union Telegraph Company and the Gold and Stock Telegraph Company having signified their concurrence in this plan and their willingness to place their conductors in the said conduit, the Board approved (with certain reservations and conditions which were accepted by the company) the construction of the proposed conduit upon certain streets.

In accordance with that approval and subsequent action of the Board, a box-conduit of creosoted wood has been laid on Fulton street, from Raymond street to Main street, and down the latter to Front street, with branches in Flatbush avenue, from Fulton to a point between Schermerhorn street and State street, and in Third avenue from Flatbush avenue to a point beyond Atlantic avenue. This line connects at the City Hall with the similar conduit previously laid through Court street to Pacific street, with a branch in Atlantic avenue from Court street to Smith street.

The system thus described has a total length of 12,420 feet, with a maximum capacity of 600 wires, or, say, 1,410 miles of wire. Cables for use in this conduit have been manufactured and will be laid as soon as the weather permits.

The action of the Board in leaving, for the present, to the companies the electrical problems involved, but at the same time giving attentive hearing to all plans and devices proposed, has had a highly satisfactory result, since a considerable number of different conductors, to some of which the attention of the Telephone Company was called by the Board, will be tried in the conduit, and thus will receive the supreme test of prolonged practical and competitive experiment.

With regard to the simple box of creosoted wood, the Board still holds a favorable opinion, though many plans, for which special advantages have been claimed, have been laid before it by inventors and others. The concretes prepared by Mr. Dorsett and by Mr. Richardson are of excellent quality, and have been proved by use in sewers and water-pipes. The Dorsett system is moreover in use at Chicago and elsewhere for underground electric conductors, and has so far an excellent record. In approving, therefore, a further extension of the conduit already laid, the Board has felt justified in permitting the New York and New Jersey Telephone Company to substitute experimentally for the creosoted wooden box, on certain parts of the line, the Dorsett and the Richardson conduit, with the view of testing practically the advantages claimed for each.

The additional conduit now authorized, and to be constructed immediately, will occupy the following streets: Fulton street, from Raymond street to Marcy avenue; Flatbush avenue, from between Schermerhorn street and State street to Bergen street; Court street, from Pacific street to Sackett street; Adams street, from Fulton street to Myrtle avenue; Myrtle avenue, from Adams street to Nostrand avenue; Broadway, from East River to Reid avenue; Union avenue, from Broadway to Hope street; Lynch street, from Broadway to Bedford avenue; Nostrand avenue, from Lynch street to Fulton street; Bedford avenue, from Fulton street to Prospect place—a total length of about ten miles, with a maximum capacity of 6,500 miles of wire.

The appended table shows the number of wires now strung on or near the route for which the subway has been constructed or authorized, the number which the construction of the subway will remove, and the number which will then remain.

Of these remaining wires, it should be said that they are partly city wires, over which the Board has no control, and partly wires of terminal distribution, which may be, for the immediate present, allowed to remain, seeing that a certain number of poles must remain until the city wires go underground. The Board is not prepared even to recommend to the city authorities the immediate placing of all police and fire wires in subways. The interests of order and safety in the community should not be lightly risked in such an experiment. It is hoped and believed, however, that the municipal department will be authorized to make proper trial, leading to a prudent and gradual adoption of the underground system, guided as to details by the practical experience of the electrical companies. It is therefore likely that for some time to come many poles will continue to stand bearing the city wires, and that many terminal wires will be allowed to remain temporarily on these poles, though the ultimate result of the change in progress will be to remove all lines of poles from the main routes, and to place the terminal distributing points off the streets altogether. This is the purpose which the Board is patiently and persistently pursuing. It is satisfied with the progress already made, and believes that neither justice nor good policy nor the demand of the statute requires more violent and rapid measures.

Some time will be required for testing and connecting the new conductors; but it is believed that before the close of the coming summer a very striking transformation will have been wrought in the appearance of the principal thoroughfares of Brooklyn, and the city will have more miles of conduit and more miles of underground wires than any other city in the United States.

In its former report, the Board mentioned the fact that a conduit of creosoted wood had been successfully operated (with telephone wires alone) in Brooklyn for nine months previously. This conduit has since been opened and examined, and is still in service, thus giving an aggregate test of sixteen months' trial. Nothing was discovered by the examination above-mentioned which was unfavorable to the creosoted wood as material for the conduit. But it was found that in some places the lead of the casing of the cables had been seriously corroded (carbonated) by carbonic acid, probably contained in the "water gas"—illuminating gas—which had leaked into the pipe. This corrosion would apparently have destroyed the lead casing, at the points where the action was most destructive, in about eighteen months. It was found, however, that only pure lead showed this reaction. Cables in the same conduit, the lead casing of which contained a little tin, were entirely unaffected. This discovery may lead to the exclusive employment of such an alloy for the casing of the cables hereafter, and it is believed that the ordinary lead pipe can be cheaply coated, and thus sufficiently protected.

An interesting question which will be, perhaps, answered by the competitive use of the conduits now about to be constructed is suggested in connection with the foregoing observations. The Dorsett and Richardson concrete conduits are intended to be water-tight and air-tight; and in securing this end much ingenuity and good workmanship have been expended in their construction. The wooden conduit, on the other hand, is neither air-tight nor water-tight. In its use the conductors themselves must have separate protection against gas and water. Accumulations of gas are not, in such a conduit, prevented by tight joints, but by ventilation. Theoretically it might be an advantage to have the conduit perfectly dry and free from gas. But such an underground space, if intended to be tight, and actually only almost tight, is worse than an open one. In trying these concrete conduits simultaneously with the wooden one, and under the same conditions, it will, perhaps, be possible to determine whether they present a real advantage in this respect; whether it is of such a nature as to permit the use of conductors not practicable in the wooden conduit; what is the value of the advantage, if any, and at how great a cost or sacrifice it is secured.

In justice to the Board, it should be added that the work thus far done has been prosecuted under great hindrances and inconveniences, arising from the failure of the Legislature to appropriate the money necessary to carry out the provisions of the statute. Since the Comptroller is authorized to recover, by assessment upon the electrical companies, the amount required for this purpose, there need have been no hesitancy in appropriating it, but the result of the omission has been that the Board has had to rely upon the private resources of its members and pay all its own expenses. Unfortunately, several important aids to the work were beyond the means of the members of the Board—the most important being the employment of a competent inspector to watch the work of construction, and make sure that the plans approved by the Board were executed throughout in accordance with its views. This duty has been discharged in part thus far by the individual Commissioners, but the extensive constructions now about to commence will require more imperatively than ever a close and continuous inspection which cannot at all times be given by the Commissioners themselves.

The Board has at present no change to recommend in the existing statute. If the Legislature will appropriate the small amount needed to carry on the work of the Board, or the Comptroller will procure it by assessing the companies in Brooklyn (which, as the Board is informed, stand ready to pay when properly notified), there will be, so far as now appears, no obstacle to the progressive, practical and satisfactory completion of a comprehensive underground system in this city for telegraph and telephone wires.

With regard to the electric light wires, the Board is not prepared to report at present.

GEORGE W. PLYMPTON,
JOHN REYNOLDS,
R. W. RAYMOND,
} Commissioners.

Here follows the table referred to in the report, showing that about 3,400 wires will be removed, and that about 550 will remain on the poles.

"I've Got 'Em on the List."*

SONG BY EX-SENATOR THURMAN, WITH PAN-ELECTRIC CHORUS.

As in this little action, prior claimants must be found,
I've got a little list,
I've got a little list,
Of inventors telephonic scattered all the world around,
Who might be sadly missed—
Who might be badly missed.
There's the great Antonio Meucci, and the famous Dan Draw baugh;
There's Gray, who neatly was forestalled by Hubbard's son-in-law;
Poor Gray who had the whole thing snugly, in his modest caveat,
Then let himself be cheated like the flattest kind of flat.
On putting all into the bill, I really must insist,
Because they might be missed—
I fear they would be missed.
CHORUS: He's got 'em on the list;
'Taint likely any's missed.
There's the German "first and only," the learned Philipp Reis;
That brilliant physicist—
I've got him on the list;
And all about "das telephon," with year and month precise.
He would be sorely missed—
He would be sorely missed.
Then there's Yates and Van der Weyde, and the Wizard Edison,
And Ott and Hughes and House, and many another one.
There's Dolbear too, who once of fighting Bell was very shy,
But now demands his rights, or else will know the reason why.
My bill includes the name of each "original" telephonist,
For fear he might be missed—
Because he might be missed.
CHORUS: He's got 'em on his list,
'Twouldn't do to have one missed, etc.
There are Voelker, Cross and Eaton, and Holcomb and his wife—
I'm a legal humorist--
So I've put 'em on the list.
With all the other claimants in this celebrated strife;
Because they might be missed—
For fear they would be missed.
I'm hired to help a statesman of the bold, unblushing kind,
Who wants to use this action as a serviceable "blind"
For all the sharp stockjobbing of the Pan-Electric crew;
And I'll have to do my level best and try to pull him through.
So it really is important to fill up my little list,
Because they might be missed—
Because they might be missed.
CHORUS: He's got 'em on his list;
You bet there ain't one missed.

G. W. S.

*The Government bill of complaint against Bell "seems, on first reading, to be *very comprehensive*."—ELECTRICAL WORLD, March 27, 1886.

The Pan-Electric Investigation.

The special investigation of the Pan-Electric scandal is still going on at Washington. The latest witnesses are Senator Harris, General Atkins and Solicitor General Goode. Senator Harris stated that he found his official influence pledged in this affair to a greater extent than he had imagined. General Atkins swore positively that he had never used, or wished to use, his official position or connections to further Pan-Electric interests. Mr. Goode testified that when suit was first ordered by him he did not know anybody interested in any telephone company, he had no stock in any company, and did not know any stockholder in a telephone company. It was due to everybody connected with the Government to say that they had but one purpose in this matter, and that was to have a fair impartial trial of this case.

In answer to a request to state the amount of fees to be paid the special counsel, witness said that Mr. Whitman was to receive a fee of $3,000 for the entire case and the firm of Hunton & Chandler $5,000. Mr. Thurman was to receive $1,000 with the understanding that his future compensation was to be fixed after the suit. He could not stipulate in advance what his fee would be, but he had said: "I have never gouged the Government, and do not propose at my time of life to begin." Mr. Lowery, who occupied an exceptional position in his capacity of electrical expert, was to receive a retainer of $1,000 and a per diem of $70 when in New York taking testimony, and $100 when called upon to leave that city, five hours being called a day. No telephone company had offered to furnish assistant counsel in this case free of cost to the Government. Witness understood that the Bell Company had retained a corps of the most able lawyers in the country to defend this suit, and regarded it as his duty to see that the Government suffered no detriment from want of counsel able to meet such opposition. He was certain that the fees agreed upon were reasonable, and that such men could not be employed in like service by individuals on more moderate terms.

Electric Music.—M. Semmola, a German investigator, one of the many who have experimented in this direction, has succeeded in producing musical tones from a metal plate by electrifying it intermittently from an induction machine. The plate is supported on an ebonite funnel and is a millimetre in thickness. The terminals of the induction machine are connected to opposite sides of the plates by wires, and the path of the current is interrupted so that sparks strike across. The plate then begins to sound, and it continues to sound even if a Geissler tube or a lead wire is interposed in the break.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, April 5, 1886.

The Kyle Electrical Manufacturing Company is moving from its temporary offices at 23 Dey street to 45 Cortlandt street, where it will be permanently located from May 1. It has secured all the upper lofts. The officers are: President, Joseph A. Macdonald, of New York; Vice-President and General Manager, Samuel Kyle; Treasurer and Secretary, John A. Seely. The company will go extensively into the manufacture of electrical supplies, making a specialty of the Seely battery. As electrical engineers and contractors its members will also attend to all kinds of hotel, house and indoor work, wiring for electric light, etc.

The Manhattan Electric Company, 737 Broadway, N. Y., is a newly-organized concern, headed by the old business managers of the New York Electric Company, all capable and energetic men. They control plenty of capital and skill. The company is now busy turning out its novelty, the "window tapper," a very ingenious device, lately described in THE ELECTRICAL WORLD, for attracting attention to store windows, etc. It can also be applied to moving figures, grotesque or otherwise. The novelty is one that ought to be handled by all supply houses and others handling such goods.

Messrs. Smith & Rhodes, 51 John street, N. Y., report a nice business in their new Universal Electro-Thermic Cut-off for electrical circuits. It can be set to the requirements of any current, and is peculiarly adapted to gas-lighting circuits, for cutting out a battery or burners after a certain time. These cut-offs are sold by E. S. Greeley & Co., Pearce & Jones, Western Electric Company, and others.

Mr. Behrens, a gentleman well known in electrical and patent circles, and at one time secretary of the Underground Wires Committee in this city, is now prominently connected with the management of the Hammond Type-Writer Company, of 143 Centre street. I am told that the company is meeting with a very active demand for its machine.

The Consolidated Telephone Company, controlling the Shaver acoustic system, appears to be doing remarkably well. The output of telephones for February and March was 568. At this rate alone the business for the year will be simply enormous, but the fact is the number grows every month.

The Coiled Wire Belting Company, of 93 Cliff street, finds an enlarging market for its patented specialty, which has now been before the mechanical and engineering public for four years, and has therefore stood the test of prolonged application. I have seen the belting on some machines and engines and like its performance. It would pay electric lighting companies to look up the subject.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Mass., April 5, 1886.

Another new system of incandescent electric lighting will soon be presented the public by the Shawmut Electric Manufacturing Company, whose factory and offices are at No. 12 Mt. Washington avenue, this city.

Prof. Moses G. Farmer, the well-known authority on electrical and other scientific matters, has been in Boston visiting relatives and friends.

Stocks of the American Bell Telephone Company have advanced during the past week from 150 to 160, on Thursday. Owing to a dull and quiet market to-day, same stock dropped to 156.

Messrs. Cupples, Upham & Co., of this city, have published a translation of N. H. Schilling's report made at Munich, on Sept. 26, 1885, as to "*Present Condition* of Electric Lighting." The writer is evidently a hostile critic of the electric light, and freely ventilates his views in favor of gas.

Messrs. Fuller & Holtzer have their new quarters at No. 27 Arch street elaborately furnished, and samples of everything they manufacture are shown up in a very attractive style. This firm will soon have ready for the trade a novelty in electric gas lighting which will be an agreeable surprise to dealers in electric goods.

The Thomson-Houston Electric Company's improvements at its Lynn (Mass.) factory are being rapidly pushed forward. It is thought that the new building, together with full equipment of machinery, will be in readiness for commencing work on various kinds of new electrical apparatus the last week in July next. The company reports from its Boston offices the recent installation of the new plants, and increase of number of its lights in various sections of the country, as follows: Natick, Mass., 38 arc and 50 incandescent lights (new); Malden, Mass, 45 arc and 150 incandescent (new); Gloversville, N. Y., 150 light incandescent machine (new); Yonkers, N. Y., 30 arc lights (new); Salt Lake City, Utah, 30 arc lights (new); Waterbury, Conn., 30 arc lights (increase); Pawtucket, R. I., 45 arc lights (increase); and Brooklyn, N. Y., an increase of 600 arc lights.

The Redding Electrical Company, of this city, has just finished two small dynamos which are intended for incandescent lighting. One machine is of 15-light (16 c. p.) capacity, the other of 25 lights. The company is at work on a 100-lighter, which will be ready for the purpose intended in a few weeks. These machines have been made from ideas and drawings furnished by an inventor, and although similar in many respects to some dynamos now in use, they contain many improvements. They are compound wound, and are said to be perfect self-regulators. Experiments have demonstrated that these machines give a steady, uniform and reliable light, hardly any perceptible heating of the armature, and no sparking at the brushes. The workmanship shown on the dynamos referred to is very creditable to the manufacturers.

Mr. Alexander G. Nye, formerly of North Falmouth, but now residing in Weymouth, Mass., has a little electrical instrument of his own make which works in the same manner that the telegraph of to-day operates. Mr. Nye makes the claim that he conceived the idea which underlies the present vast system of telegraphy, before Prof. Morse's inventions were patented. This gentleman is a dentist and a chemist, being, he alleges, one of two persons in this country who can melt platinum.

The town of Nantucket, Mass., is soon to celebrate the completion of the laying of the cable which will connect it with the mainland.

The Middlesex Electric Light Company, of Lowell, Mass., reports a large increase recently in commercial orders for arc lights, and requests have been received from all parts of the city for incandescent lights. The system used by this company is the Thomson-Houston. The plant is one of the neatest and best equipped in New England. The engine used is a 250 horse-power Harris-Corliss, and it furnishes power for eleven 80-light dynamos, by means of counter-shafting, from which the machines are belted.

The Waterhouse Electric & Manufacturing Company, of Hartford, has filled an order for one of its dynamos for the New Haven Electric Light Company.

The Putnam Machine Company and the Putnam Tool Company, of Fitchburg, consolidated their interests under one management last month, but will retain the old names for the present for greater convenience. The former company is about to celebrate the fiftieth year of its existence, and no doubt it will prove a very interesting semi-centenary. It is the largest manufacturing enterprise in Fitchburg, was established in 1836 by the late S. W. Putnam, and is now conducted by his four sons, Messrs. Henry O. Putnam, S. W. Putnam, Chas. F. Putnam and George E. Putnam. This company manufactures a very fine line of automatic steam engines, power and foot lathes and general machinery, consuming annually from 15,000 to 20,000 tons of steel and iron.

W. I. B.

PROVIDENCE, R. I., April 3, 1886.

The Rhode Island Telephone and Electric Company has just issued to electrical dealers a neat, brief and comprehensive circular, which is a credit to the corporation and a striking sample of the handiwork and good taste of the printers—Messrs. Livermore & Knight, of this city. It relates to the popular Little Giant Battery.

The A. W. Harris Oil Company has now ready for the market a superior grade of dynamo oil, which is almost as clear as crystal and of excellent quality. For several years past this company has enjoyed a widespread reputation for manufacturing a very desirable oil for lubricating cylinders of steam engines, know as the A. W. Harris valve oil.

Mr. Chas. T. Hughes was recently constituted the representative of the Edison Company for isolated lighting for the State of Rhode Island, with headquarters at No. 24 Butler Exchange, this city.

The officers of both the electric lighting enterprises in this city report new business as very encouraging in the way of orders for large and small electric lights. The Narragansett Electric Light Company, which uses the Thomson-Houston system, has recently increased its plant in both arc and incandescent lights. The Rhode Island Electric Light Company, which uses the United States (Weston) system, enjoys a steady and increasing demand for its incandescent lamps, particularly for those of 125 c.-p., better known as the "Moguls."

The Narragansett Machine Company has recently furnished a number of its foot-power lathes to amateur electricians for experimental work. This company manufactures a strong and reliable lathe, for which it asks a very modest price.

W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
PHILADELPHIA, April 5, 1886.

The Western Union here has just invested in some costly fowl—turkeys, by the way—which are a drug on the market at this time of the year. The legal decision is an interesting point of telegraphic law. It was delivered by Judge Arnold and refuses to grant the defendants a new trial of the suit brought by Wilbert Richman against the Western Union Telegraph Company. Richman is a poultry dealer in Yorketown, N. J., and in October, 1884, telegraphed to New York for a quotation on turkeys. The New York firm replied, "Twenty-two cents for fat young turkeys," but when the message was delivered to Richman it read "thirty-three cents." Noticing that the price was high he asked the telegraph operator whether there were not some mistake, but the latter replied, "I thought it was high, too, and I asked back whether they meant thirty-three and they said 'yes.'" Richman accordingly acted on the telegram and lost $116 by so doing. He sued the company; no defense was made upon the merits and he recovered a verdict for that amount, whereupon the company applied for a new trial. In refusing the motion Judge Arnold lays down some wholesome laws which will be interesting to telegraph people. He says: "It is said that the plaintiff by his former use of telegraph blanks had notice of the regulation of the company requiring messages to be repeated. That point may be conceded so far as the sender of the dispatch is concerned, but I have not been able to find any ruling that the receiver of the dispatch is so affected. Telegraph companies recognize this difficulty, and to avoid it usually deliver the message on a form which states that the company transmits and delivers messages only on conditions limiting its liability, which conditions have been assented to by the sender, and informing the receiver that the message is an unrepeated message, and that the company will not hold itself liable for errors or delays in unrepeated messages. There was no such notice on the form used in delivering the erroneous message to the plaintiff in this case. It is said, however, that the plaintiff had suspicions of the correctness of the dispatch, which put him upon inquiry and so affected him with knowledge, and that the statement of the operator that he had asked back and that the message was correct did not relieve the plaintiff from the duty to order it repeated. This contention would be of much weight if the action had been brought upon the contract, or if the company was an insurer of the correctness of messages. Then there being no consideration paid for the insurance or for repeating the message, the plaintiff would have no right to complain. The prime object of the agreement is to secure accuracy in transmitting the dispatch; the earning of a premium or pay for repeating is secondary. When the plaintiff asked the operator if the message was correct, and was told that he had already asked back and that they said 'yes,' what use or necessity was there for the plaintiff to do the vain act of again repeating it? That would be repeating it; and the question naturally arises, when is repeating to stop? Had the operator said that the message was correct, without saying that he had asked back, there might be some force in the argument. In an action against a telegraph company for the injury sustained through acting upon an altered message, the plaintiff establishes *prima facie* the negligence of the company by proving the difference between the message which the company agreed to deliver and

that which it did deliver. That was shown in this case, and no legal excuse or defense being offered by the company, the verdict for the plaintiff was right."

Some interesting tests of the destructiveness of powerful electrical currents were made on Friday afternoon in the office of the Bankers and Merchants' Telegraph Company, by W. T. Brown, Electrician of the Pennsylvania Railroad Company. This gentleman has a large number of telegraph wires under his direction, and as a result of his experiments for their protection he has contrived a little instrument that effectually prevents damage to wires on buildings from dynamic or other charges of electricity. In order to show the thoroughness of the tiny apparatus, Mr. Brown took two other protectors that are in public use and showed by passing electrical currents through them that they would not protect at all.

Great interest is being taken at present by the members of the Franklin Institute in the new process for obtaining pure aluminum from aluminum oxide or broken corundum. A committee of the chemical section of the institute, headed by Professor L. B. Hall, of Haverford College, has just prepared and presented a report highly commending the method discovered and perfected by Eugene H. Coles, of Cleveland, Ohio. The committee regards the invention as one of the highest importance, on account of the cheapness to which it reduces the hitherto extremely expensive metal. It is claimed, in fact, by the inventor, and with apparently good reason, that the new process of electric smelting within the next five or ten years is destined to revolutionize the brass and bronze trade of the world as the Bessemer converter has the iron and steel industry.

The cable for the Brooklyn Telephone Company, made by A. F. Moore and covered by Tatham Bros., is all ready for shipment. It is 15,000 feet, 105 wires. D. Brooks, Jr.'s, insulation is used, and tests which have been made show the working to be very good.

The Clark Insulated Wire Company's property at Bristol was sold at public auction on March 31 to J. Chester Wilson, the General Manager of the company. It has not yet been determined how the business will be carried on hereafter. The factory, however, is keeping right along in its former business.

Partrick & Carter, of 114 South Second street, this city, are about issuing a very complete catalogue of their different specialties, such as burglar alarms, annunciators and call bells, and bell-hangers' supplies. The immense sales of their goods to the trade, throughout the country, attest their superior qualities.

The Edgerton Motor Company has removed to 1409 Chestnut street.

Mr. Griscom, President of the Philadelphia Dynamic Company, returned from Europe last Thursday, where he has been for two months looking after the foreign business of his company.

Palmer, Cunningham & Co. have opened a tool depot at 415 Commerce street, where they will keep in stock a full line of tools used by electricians. The three young men composing the firm have had long experience in the business, and any order intrusted with them will receive prompt attention. E. F. I.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, April 3, 1886.

When somebody makes an invention in such shape that it seems likely to amount to something, it appears to be the rule for said invention to be immediately claimed by half a dozen others, and the railway induction telegraph system is not proving an exception. It is not especially to bring out this point, however, that I refer to the matter; but I notice that one of the parties claiming this invention includes in his claims a resonator attachment for attracting the attention of the baggagemaster to his instrument. Something of this kind is sorely needed. With a device of this kind one of the great objections to the system in its present stage of development—that of keeping the operator constantly shackled to his instrument—would be removed, and it would only be necessary to make the baggageman a telegraph operator, and his services would only need to be given to the instrument in response to calls or signals therefrom.

The Sperry Electric Light Company is adding rapidly to the large number of its plants already in operation. Recent installations and orders include a 60-light arc plant to the Fort Scott Foundry and Machine Works: a 40-light arc outfit to Wm. B. Myers & Company, Carthage, Mo.; a 40-light arc plant to the Electric Light and Power Company, Ottawa, Kansas; a 20-light arc plant to the Electric and Water Supply Company, Neilsville, Wis.; a 60-light arc plant to Wonder & Abbott, Chicago. Besides the above, the company has on hand several other large orders which I am not at liberty to mention just yet. I am very happy to be able to state that the financial complications existing the last few weeks in connection with the Sperry Company have all been happily adjusted, and the company is now in an exceedingly satisfactory condition in this respect. The company has been very fortunate in securing for its new President, Mr. L. Everingham, the prominent Chicago commission merchant, a man of wealth and fine business attainments, who is known all over the West and Northwest. It is Mr. Everingham's intention to give his personal attention to the company's management, and to place the Sperry light in a business sense where it has long been in other respects, in the front rank. Knowing what I do of Mr. Everingham's resources and business methods, I confidently predict that the object aimed at will be attained. The company has elegant offices at 201 Royal Insurance Building. Rumor has it (I might add as a sort of postscript) that Mr. Elmer B. Sperry, the company's electrician, is soon to enter the realm of matrimony.

On March 26 the board of directors of the Rocky Mountain Bell Telephone Company declared a dividend of one dollar per share, payable April 1. This is the second dividend declared by this company this year, a similar amount per share having been paid to stockholders January 15.

Painesville, O., is being introduced to the electric light for the first time, and is very much pleased with the new acquaintance. Three 25-light machines of the Western Electric pattern are now in operation there. The first turning on of the current at Painesville, by the four-year-old daughter of the editor of one of the local journals, furnished the occasion for quite a brilliant affair.

The following telegram from Youngstown, Ohio, appeared in the Chicago papers under date of March 30:

"A practical test of the new telephone transmitter of the Rose Electric Company was made yesterday under conditions that demonstrate beyond a doubt its superiority over the Bell instrument now in common use. For some time the inventor, Lucien C. Rose, has been secretly at work, and recently the Inventors' Aid Association of this city undertook to assist him. Under its direction application has been made for a patent, and pending the consideration of the case the practical tests referred to were made. Yesterday an instrument was placed on the wall of the inventor's private room in the Wick block. It was connected by means of the United Lines' wires in the basement with Freeport, where connection was made with the Postal Telegraph's wires. The return was made to an instrument in the basement of the Wick Block, thus making a continuous circuit 878 miles long. The transmitter and receiver resemble in outward appearance those of the Bell instrument, but within there is a difference known only to the inventor. The experiment was successful in every particular, conversation being carried on with perfect ease over the immense length of wire. At no time was it necessary to raise the voice above the pitch used in common conversation. A similar experiment was tried a few weeks ago, when a circuit of 960 miles was used, and this also proved successful. The company is now getting ready for a more thorough test. One of the instruments will then be taken to New York City and attached to a Chicago wire, while the other will be placed here and connected with it by way of Chicago, thus making a circuit of about sixteen hundred miles."

The Western Electric Company have just received the contract for a lighting plant for Easton, Pa., of 60 arc lights. All the lights are for city lighting purposes, and the city buys the entire plant outright. The city went at the selection of a system in a very thorough and systematic manner, sending out committees to inspect plants representing the different leading systems, with instructions to make their investigation as searching as possible. After having the claims of the different systems competing presented to them and considering the matter in all its bearings, it was decided to adopt the Western Electric apparatus. After so thorough an examination of the different systems the Western Electric Company should consider the adoption of their apparatus a strong testimonial in favor of the excellence of their system.

The St. Joseph, Mo., Electric Light Company are now running 100 Thomson-Houston arc lamps, and are shortly to add incandescent lighting to their business.

The Van Depoele Electric Manufacturing Company have removed from 203 Van Buren street to 15–21 N. Clinton street, where they have larger floor space and much better accommodations. Late sales of this company are as follows: 70-light plant to the Capital City Gas Company, Des Moines, Ia.; 60-light plant to Shreveport, La.; 60-light plant to Texarkana, Ark. The foregoing are all arc plants. They have also furnished a 300-light incandescent plant for the Cincinnati *Commercial Gazette* Building. In their electric railway department they are pushing the work on the Appleton, Wis., equipment, and Mr. Van Depoele himself is now in Montgomery, Ala., superintending the construction of the road there. This latter road, in fact, is rapidly nearing completion and will soon be in operation.

The Indianapolis Jenney Electric Company last week closed contracts for plants at Martinsville, Ind. (arc), and Saratoga, N. Y. (incandescent).

Although on March 31 about 500 contracts expired in Indianapolis, no move has yet been made by the Central Union Telephone Company to remove the instruments in accordance with its circular. In case it endeavors to remove the telephones it will probably be confronted by injunctions at every step. From information received, it seems that there is a "movement" on foot among the "leading business men," looking to some arrangement with the telephone company by which *the subscribers would take charge of the business* and *select a committee of managers*, each subscriber paying his share of the actual expenses of operating the exchange. I am afraid that this "movement" will be strictly confined to the "leading business men," for if the telephone company has not had taken away from it by the outrageous legislation of that State all rights which others than communists might be expected to respect, it will certainly never give a second thought to any such proposition as this.

A company has been formed to operate an incandescent lighting plant in Topeka, Kan.

Lawrence, Kan., is to have a company to operate an incandescent system, I hear.

I understand that negotiations which have been progressing for some time are likely to result in the establishment of a general electrical supply house in Kansas City.

The Kansas City Electric Light Company is now operating 300 arc lamps and 350 incandescent.

And now an electric light company is being boycotted. Who says the electric light is not obtaining recognition?

The contract which the Dorsett Underground Conduit Company has with the New York and New Jersey Telephone Company calls for five miles of conduit.

W. A. K.

THE TELEGRAPH.

T. M. B. A.—Assessment No. 196, for April, is $1, covering the death claims of T. P. Harvey, W. Hunter and V. H. Muse.

Sold for Fence Wire.—The military telegraph wire from Fort Sully to Fort Yates, D. T., has just been taken down and sold to farmers for use as fence wire.

Direct to Australia.—The Indian Telegraph Department have urged the Government to extend the telegraph line from Quetta to Penjdeh or Meshed so as to furnish a direct line to Australia.

Handsome Earnings.—The Telegraph Construction and Maintenance Company, of London, paid a dividend of 20 per cent. last year, and has contracts on hand sufficient to earn the same this year.

Prof. Cleveland Abbe anticipates the time when each citizen shall have the right to pay ten cents and demand his special weather telegram, precisely as he pays his two cents and demands to have his letter carried by mail.

Japanese Weather Bureau.—A telegraphic weather service has been established in Japan by the Imperial Meteorological Observatory, and receives reports from twenty well-distributed stations. It issues maps and bulletins three times a day, but will not attempt forecasts until the experience of the service has given a better knowledge of the conditions governing Japanese weather.

Not a Likely "Trade."—The rumor in Wall street that Cyrus W. Field had sold his Western Union stock to Jay Gould and that Gould had sold his Manhattan stock to Field is denied. A Gould broker also denies the rumor, and says that as Field owned only 1,000 shares of the Western Union, worth $64,500, and Gould owned 50,000 shares of the Manhattan, worth $6,350,000, the alleged transaction was absurd, inasmuch as Field would probably not be able to pay the difference between the two amounts.

Cost of Telegrams.—To a deputation from the Association of Chambers of Commerce, in England, who waited upon the Postmaster-General recently, the latter stated that one result of the international telegraphic conference was that the telegraphic rate to India would be reduced from 4s. 7d to 4s. (96 cents) a word; to Russia, from 9d. to 6½d. (13 cents); to Spain, from 6d. to 4½d. (9 cents), and reductions would also be made to other European states and to Australia, and probably other countries in the East.

Telegraphic Treatment.—There is a gentleman living in Detroit, where he has been for four or five years, who, when taken ill, is invariably treated per mail or telegraph. He formerly lived in this city, and here became professionally acquainted with an up-town physician who also keeps a drug store. If the ailment requires immediate treatment the Detroit man telegraphs his symptoms to the Buffalo doctor, and the latter wires back the prescription. When possible, however, a statement of the trouble is carefully written and sent by mail, and the physician is requested to compound the remedy himself and transmit likewise.—*Buffalo Courier.*

Canada Claims the Air Telegraph.—A dispatch from Toronto of April 4 says: Dr. A. M. Rosebrugh, a reputable physician of Toronto who has given considerable attention to telephonic and telegraphic apparatus, read a paper at the Canadian Institute last evening, in which he claimed that the air telegraph or new railway telegraph system for communicating with trains while in motion is largely a Canadian invention. The principle upon which the air telegraph is worked, he says, was invented eight years ago by gentlemen in Toronto and Hamilton, and particularly by George Black, of Hamilton. The remaining elements in the system of the air telegraph developed by Americans are the using of the metallic roof of a railway car as one pole of an electric condenser, and the utilizing of revolving wheels for completing an electric circuit.

The Ship-Worm and the Cable.—The *teredo navalis*, which is so destructive to wooden ships and submarine wood-work in southern latitudes, requires even to be guarded against in submarine cables. In the one recently laid between Mozambique and Zanzibar, the insulated core was protected by brass tape. This forms a complete protection against the teredo, which otherwise destroys the insulation of the cable. This type of cable is being much used where the teredo is found. Copper tape was used for some submarine cables many years ago, but not for the protection of the insulator. Its application for that purpose is recent, although the plan was patented nearly twenty years ago. Copper tape is also used for protection against land insects in some places where underground wires are necessary, all other methods to protect the insulation having proved ineffectual there.

Lecturing on Telegraphy.—The lecture given on Monday night in the lecture hall of the Wesleyan Church, by Mr. Trenaman, District Agent of the G. T. R., at Levis, was attended by a large and respectable audience, says the Quebec *Morning Chronicle* of March 10. The lecture was under the auspices of the Ladies' Aid Society, and the silver collection at the door for so full a house must have been large. Mr. Trenaman chose for his subject "Telegraphy," with experiments, and during fully one hour and a half he kept the audience interested in his discourse and experiments. He was assisted by Mr. Barclay, Manager for the Great Northwestern Telegraph Company. At the conclusion of the lecture, Rev. Mr. Sparling proposed a hearty vote of thanks to the lecturer, which was seconded in flattering terms by the President of the Press Association of Quebec, and indorsed by the whole audience.

Tricks of a Newspaper Correspondent.—The devices of newspaper correspondents at Washington to obtain the news are often ingenious and sometimes dishonest. Back of the House and Senate galleries there are large rooms with tables for writing and telegraphic facilities for sending dispatches. The correspondents do much of their writing at these tables, and one of them, who had been a telegrapher, sat and listened to the news of his competitors as it went clicking over the wires. The striking similarity of his dispatches to those of other correspondents soon exposed the trick, and a change was made to thwart him. This lazy but smart correspondent, however, got the news, and his opponents were at a loss for a long time to find out how he did so. They finally set a watch upon him and found that he was in the habit of going up over the house where the telegraph wires ran. He had a fine sense of touch, and was so good a telegrapher that he could read what was going over the wires by wetting his fingers and placing them upon them. So the story goes.

Ahead of Edison.—A dispatch of March 21, from Chicago, says: It seems that Edison's latest invention of telegraphing to and from a moving train was anticipated by a Cincinnati telegrapher and electrician, who secured a patent for the same thing on July 12, 1883. The description of the apparatus in the patent is identical with the Edison apparatus, with one exception only. Edison uses a telephone receiver and the prior inventor what is called a resonator. That is the only difference between them. The inventor is W. L. Silvey, of No. 131½ Clinton street. At the time the patent was issued Silvey lived at Castleton, Ind. At present he is perfecting a new electric light machine and has paid no attention to his induction telegraph. He expresses himself as highly pleased with Edison's success and shows no jealousy whatever. He said that he had worked out his invention on a farm in Indiana, rigging up wires in his father's orchard and telegraphing from one wire to another forty feet away, a greater distance than Edison has bridged over. Silvey thinks that his apparatus is superior to Edison's and that his produces sounds that are audible in a room, while Edison uses a telephone receiver to hear distinctly. One year after his first patent he patented an improved receiver which still further increases its availability. There is no possible room to doubt his having beaten Edison by two or more years.

THE TELEPHONE.

The Non-Electric Telephone Company, Baltimore City, Md., has been formed with a capital stock of $200,000.

Virginia.—A local telephone company has been incorporated at Wytheville, Va. J. A. Baumgardner, President; and G. J. Holbrook, Secretary.

The Egan Telephone and Telegraph Company, Columbus, Ohio, has been incorporated with a capital stock of $100,000. William Y. Miles and others, incorporators.

Aerial Cables.—The Bell Telephone Company of Missouri is now putting up several miles of one hundred conductor kerite aërial telephone cable, just furnished to it by Mr. Clark B. Hotchkiss.

Cape Cod.—A petition is now being circulated in Boston, for presentation to Congress, asking that the well-known life-saving stations on Cape Cod may be equipped with telephones, so as to increase their usefulness.

Six Dollars a Month.—The bill of Senator Reilly, offered recently in the New York Legislature, fixing telephone charges in New York and Brooklyn at $6 per month, has been reported for the consideration of the Senate by the Cities Committee.

A Lecture.—Before the Buffalo Electrical Society on March 19, Mr. Frank Kitton, chief operator of the Western Union Company, delivered a lecture on "The History and Development of the Telephone." The lecture was heard with great interest. Mr. Kitton exhibited and explained various telephonic apparatus and made several experiments illustrative of his statements.

To Use Meucci Telephones.—A company has been formed, called the Citizens' Telephone of Newark, N. J., for the purpose of doing a general telephone exchange business, and it is said that the construction of lines will be begun as soon as 300 subscribers have been obtained. It is said that 100 of these were secured in one day last week. The new company claim that the rentals will be 30 per cent. less than those charged by the Bell Telephone Company. The Meucci telephone will be used.

A Life Sentence.—A special dispatch from Boston, of April 3, says: Henry K. Goodwin, the inventor, whose trial at Salem, a few months ago, for the shooting of Albert D. Swan, of the Lawrence Telephone Company, attracted so much attention, both on account of the prominence of the parties and the skill displayed in the defense in the effort to sustain the insanity theory, is to be sentenced at the term of the Supreme Court which comes in on the 20th inst., the exceptions having been waived. He is to receive a life sentence for murder in the second degree.

A Victory for the Bell Company.—A special dispatch of April 5, from Philadelphia, says: In the United States Circuit Court, before Judges McKennan and Butler, argument was to-day heard upon the petition filed by counsel for the Clay Commercial Telephone Company, which asked to have annulled the restraining order issued in the suit of the Bell Telephone Company against the defendants. The prayer of the petition was dismissed and the counsel for the Bell Company was asked by the Court to prepare a final decree in favor of his client and to submit it to the court to-morrow, so that the appeal of the case to the Supreme Court of the United States could be expedited.

The Telephone on Board Ship.—Capt. J. D. Randall, master of the steamer "Enquirer," of Memphis, Tenn., writes to us making claims to be the first to employ the telephone on board of a steamboat. His steamer, when at the landing, is connected with the exchange, and the arrangement is found to be very convenient. The telephone is "grounded" in water and works very well. As it is not possible for the river steamers to land at the city wharf every day in the same place, a wire is strung up and down the river, and from each pole a loose wire hangs down, to which connection is made. From that it runs to the boom of the stage rigger, at the bottom of which a wire is connected to the telephone in the office of the steamer.

THE ELECTRIC LIGHT.

France.—The electric light has recently been introduced at La Roche, Modane, Jenne, and Bellegarde.

Birmingham, Ala.—The Gas Light and Illuminating Company is entertaining a project to erect an electric light plant with a capacity of 150 lights.

Brooklyn, N. Y.—It is proposed to increase largely the city electric lighting this year, and petitions have been sent in by private parties asking for the light.

Baltimore, Md.—Ordinances have been granted by the city authorities for the use of the streets to the Excelsior Electric Light Company and the Southern Baxter Electric Light Company.

For the Edinburgh Exhibition.—The Thomson-Houston Electric Light Company has shipped four dynamos and several arc and incandescent lamps to the Edinburgh, Scotland, exhibition.

Northampton, Mass.—The Thomson-Houston Company has taken the entire basement of Clapp's foundry, and will put in a new engine of 75 horse-power to run its two dynamos, while an additional boiler will also be put in at once.

Geneva, N. Y.—The Brush-Swan Electric Light Company, Geneva, N. Y., is preparing to erect a new station, which will be fully equipped with the most improved Brush apparatus, comprising arc and incandescent lighting on the same circuit, and the Brush incandescent system direct.

Painesville, O.—An arc plant installed by the Western Electric Company has just gone into operation. It comprises three 25-light machines, and the power will be furnished by the large engine in an adjoining skewer factory until a new 120 horse-power engine can be put in. At present 40 lights are in use. The service is giving great satisfaction.

Extradition Proceedings.—The proceedings have been revived against Mr. E. H. Goff, in behalf of the Canadian Agricultural Insurance Company, under circumstances already well known. It is sought to extradite Mr. Goff, and a warrant of arrest has been obtained through Commissioner Osborne and served. Motion for bail, pending the hearing, is to be made this week.

New York City.—Among the bids for lighting the city this year are the following: United States Illuminating Company, for electric lamps in streets south of Fourteenth street, 70 cents each per night; Brush Electric Illuminating Company, for electric lights in several streets north of Fourteenth street, 70 cents each per night. The bids include several streets not before lit by electricity, and take effect May 1.

New Local Companies.—The following companies have lately been organized: The Citizens' Electric Light and Power Company, Newcastle, Pa. Capital stock, $17,500. Treasurer and attorney, Roy S. Foltz, of Newcastle. The Consumers' Electric Light and Power Company, Aspen, Col. Capital stock, $50,000. David R. C. Brown and others incorporators. The Canon-Thomson-Houston Electric Company, Canon City, Col. Capital stock, $48,000. S. R. Dewey and others, incorporators. Waupaca Electric Light Association, Waupaca, Mo. Capital stock, $10,000. Charles Churchill and others, incorporators.

The Electric Light in German Universities.—An agreement has been entered into between the German Government and the Edison Company in Berlin for the supply of electricity to the university in that city. The necessary works will be carried out during the coming summer holidays, after which the whole of the buildings will be lit by glow lamps and arc lights, to the entire exclusion of gas. The current will be supplied from the central station in No. 85, Friedrichstrasse, and will be used not only for lighting, but also for experimental purposes in the laboratories attached to the university. The primary object of this installation is to afford the Minister for Education in Germany an opportunity of satisfying himself on the applicability of the electric light to schools and other educational establishments; and if the verdict should be in favor of the new illuminant it will be introduced as a general thing in universities and schools. As a matter of fact negotiations are already pending with regard to the introduction of the electric light at the old and world-known university of Halle, and many other seats of learning will in due time follow.

APPLICATIONS OF POWER.

The Hydro Electric Railway Motor Company, Chicago, Ill., has been incorporated with a capital stock of $500,000. Charles Wondries, Jr., and others, incorporators.

Freight Cars Drawn by Electricity.—Mr. John C Henry, of the Henry Electric Railway Company, Kansas City, Mo., writes as follows: "On January 29 I hitched our electric car Pacinotti to a K. C., F. S. & G. coal car, weighing 17,500 pounds, and took it up a 2½ per cent. grade. Yesterday I coupled the same motor car to C., B. & B. box car 19,178, weight 24,500 pounds, and started it, without jerking, on a 3 per cent. grade. I claim the distinction of being the first to haul regular standard gauge freight cars by electricity, and would be pleased to have you record it."

St. Louis, Mo.—An elevated electric railway bill, passed by the City Councils of St. Louis, has been vetoed by Mayor Francis, who says in his message: "An elevated railway, with electricity as the exclusive motor power, to be restricted to the carrying of passengers, would be a credit to the city and undoubtedly a benefit to the people at large; but the rights of property damaged by its construction should be securely protected, and the bill should be so framed as to leave no question as to the exclusion of steam as a motor, or as to the possibility of its being converted into a freight road while in the hands of its projectors or their successors."

PERSONALS.

M. Marcel Deprez.—On March 1, M. Deprez was nominated a member of the French Academy of Sciences. This honor was conferred upon him not only on account of his work in the field of electricity, but also in that of mathematics and applied mechanics.

Mr. Stephen D. Field.—The many friends of "Steve," as they are wont to call him, will regret to hear that the health of the talented inventor still continues bad, in spite of his late trip to Europe, and that he is unable to leave his home at Yonkers. His early return to work will greatly cheer those who are associated with him.

Mr. Wm. Stanley, Jr., is the electrician of the Westinghouse Electric Company, and it is largely to his work that the company is indebted for the completeness of its system and its high efficiency. Mr. Stanley is probably not more than thirty. He is at present engaged for the company on important work of which more will be said hereafter.

Mr. Charles E. Loew, of the New York Electrical Subways Commission, is still so seriously ill that, even under the most promising circumstances, he will probably not be able to act for some time to come. His colleagues, Messrs. Theodore Moss and Jacob Hess, say that were he able to meet with them the underground wire problem would soon be solved. Meantime it is not solved.

Mr. George F. Shaver, the President of the Consolidated Telephone Company, is building an elegant Queen Anne villa on Jersey City Heights. A number of novelties will be introduced by Mr. Shaver, who is quite ingenious in hitting on new mechanical devices. One thing is a switchboard for throwing the steam heat into any part of the house at will. All the rooms will be lighted by electricity, and in place of speaking tubes, a complete Shaver acoustic telephone system will be used. It will be remembered that Mr. Shaver's house on Staten Island, "Oakwood," once in the possession of the Vanderbilt family, was lately destroyed by fire.

General Hazen, in his testimony before the House Committee on Expenditures in the War Department in regard to accounts in the Signal Service, said last week he had never expended a dollar improperly, or, as he thought, without authority. He had tried to improve the service in every way, and in so doing he might possibly have seemed extravagant, but he had never knowingly or wilfully misappropriated a single cent of money. General Hazen said he had for a long time been pursued by designing and wilful men, who had never ceased to try to injure him and to pursue him with every calumny that could possibly be conjectured by a malignant and vicious man. Certain newspapers, he said, had also never ceased to assail his character or to question his motives, but he was inclined to speak kindly of them.

MISCELLANEOUS NOTES.

Assistant Superintendent Ray, of the Connecticut River Railroad, has secured a patent for his electric bell cord, and several of them are now in use on the trains.

"The Locomotive."—Under this title a very useful monthly is issued by the Hartford Steam Boiler Inspection and Insurance Company. It can be obtained free from any of the company's agencies, or is supplied at 50 cents a year direct. It gives a good many "points" of interest and value to all users of steam and all who own or run boilers.

A Hotel Struck by Lightning.—During the thunderstorm on the night of March 31, the old Jesse Conklin Hotel, at Whig Inlet, in the Great South Bay, Suffolk County, N. Y., was struck by lightning and set on fire. The building and contents were entirely consumed, involving a loss of about $10,000. The hotel and furniture were partially insured. The Conklin Hotel was for 25 years a famous resort for men about town.

Accident with an Electric Gun.—C. S. Seyton, formerly a stockbroker in New York, was killed on April 1, in London, in a singular manner. He was examining an electrical gun of American invention, which he was about to introduce to British trade, when it went off, putting a bullet through his heart and killing him instantly. Only recently Mr. Seyton lectured before the United Service Institute on the merits of the invention.

The Magnet in Milling.—One of the small things which will help the buhr miller is the use of the magnet. It is supposed by many that any device so simple and efficient as the magnet would be in every mill, but it is not. They make a separation which cannot be made by any other device. When the wire binders came into use some of the millers thought it would be necessary to exterminate them by refusing to buy wheat from the field in which they had been used. The magnets pacified them, and showed that there was more metal in other forms than wire to be taken out than the wire itself, even from the wheat on which the wire binders had been used.—*Millstone.*

The Tallapoosa's Steering Gear.—Last week another trial was made off New York of the Tallapoosa's steering gear. The trial, lasting three days in very heavy weather, is considered a success for the new gear. Many changes have been made in the machinery, both in the electric and pneumatic features of the invention, since the first formal trial, and the inventor and the members of the Board are said to be satisfied that the machinery may now be considered a success. Our new navy vessels are likely to be fitted out with the apparatus, which enables one man to steer a ship with a finger in a gale of wind, when four men are ordinarily expected to stand by the wheel. The Board of Officers conducting the trials consisted of Lieutenant-Commander Bradford, Lieutenant Cornwall and Ensign Duncan.

SPARKS AND FLASHES.

No Profane Language Allowed.—An insurance man tells a story of telephone experience in Detroit which has both a serious and comical aspect. The Burnham Wire-Works at Detroit took fire, and the watchman on duty rang up the telephone lady, who, as in this case made and provided, asked, "What number do you want?" Watchman—"Give me the Fire Department, quick." Telephone Lady—"What number do you want?" Watchman—"Oh! blank the blank number; give me the Fire Department. We are all afire. Blank, blank, blank; quick!" Then, having notified the fire-worshipers of the state of things, he rang up again and asked for the house of one of the principals and was informed by the telephone lady that "the service at the Burnham Wire-Works had been discontinued on account of profane language having been used."

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—B. & M., b 2, a 3; Western Union, b 65, a 65¼.

Telephone.—Am. Bell, b 156, a 157; Erie, b 28¼, a 28½; New England, b 33½, a 34.

Electric Light.—Edison, b 200.

BUSINESS NOTICES.

Copper Drop Forgings for Electrical Purposes.—The Billings & Spencer Co., of Hartford, are successfully producing drop forgings of pure copper for electrical purposes, and have taken an order from the Edison Machine Works, of this city, for a quantity of such goods. These forgings take the place of a combination casting, which had to be soldered together, making a much better quality at lower rates. The company are said by the *Iron Age* to be the first to attempt forging in copper. They are full of business in their regular line of steel and iron drop forgings of all kinds.

Volta Pavia.—The Chemical Electric Light and Power Company, of Boston, furnishes the following as a revised estimate of the cost of running 8 incandescent lamps. Say

30 cells 1¾ gall. each, No. 2 B Volta Pavia, 52 gall. @ 50c.		$26.00
30 " 1 " " No. 5 E " " 60 @ 10c.		6.00
	(One renewal inner cup.)	
30 " 3 lbs. each, zinc each renewal, Volta Pavia, 90 lbs. zinc @ 8½c.		7.65
	Hence, 8 lamps for 300 hours equal	$39.65
	and 8 " " 1 hour equal	13·25c.
	or 1 lamp " 1 " equal	01·66c.

Equal to gas at $3.25.

8 gas burners 5 feet each equal 40 feet × 300 equal 12,000 feet at $3.25 equal $39.00.

Medical Electric Machines.—The general advance in

electrical science of recent years has made itself felt in medical as well as other electrical apparatus. Some of the most satisfactory instruments are those manufactured by the Jerome Kidder Co., of New York. They have received a number of awards for superiority, and well deserve it for their fine finish and durable powers.—*Philadelphia Medical and Surgical Reporter.*

Electroplating Plant for Sale.—A new and complete electroplating and electrotyping establishment is offered for sale at Detroit, Mich. It was but recently equipped, when the death of the proprietor brought everything to a standstill. The opportunity is very advantageous. Particulars can be had from the Detroit Knitting and Corset Works, Detroit, Mich.

Hill's Hair and Whisker Dye
Colors to any natural shade of black or brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.
HALE'S HONEY, the great cough cure; 25c., 50c. and $1.
GLENN'S SULPHUR SOAP heals and beautifies the skin; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED MARCH 23, 1886.

(1) **338,260.** (2) **338,261. Armature**; Charles A. Gaiser, Edwardsville, Ill. (1) They consist of improvements upon Henry Stroh's patent, 186,584, April 17, 1877.

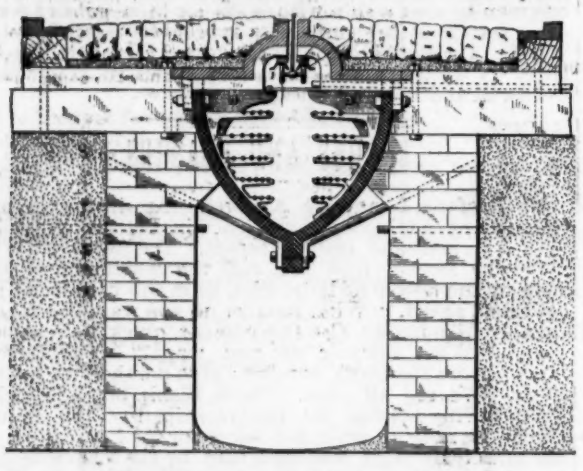
338,261. Telephonic Transmitting Apparatus; James T. Guthrie, Leesburg, O. Consists of the diaphragm, the carbon bar, the metal arm and spring metallic electrode supported thereby, and the plumbago electrode bearing against said metallic electrode.

(1) **338,292.** (2) **338,293. Watchman's Clock**; Lloyd W. Pennell, Braintree, Mass., Assignor to the Tarbox Time Register Company, Portland, Me. (1) One member of the device is moved toward the other by the clock from a predetermined starting-point, after each operation of the recorder. (2) The circuit-controlling device consists of a metallic brush rotated by a shaft and a disc of insulating material provided with studs, co-operating with the said brush.

(1) **338,313,** (2) **338,619. Electric Railway**; Frank J. Sprague, New York, N. Y., Assignor to the Sprague Electric Railway Co. (1) In an electric railway system, the combination of working conductors from which the motors derive current, and main conductors extending along the line and connected at intervals with said working conductors, said main conductors being divided into sections and provided with means for connecting and disconnecting said sections. (2) The working conductors are provided with a shield to protect them against the weather.

338,315. Watchman's Time Recorder; James E. Tarbox and Eugene H. Taylor, Assignors to the Tarbox Time Register Co., Portland, Me. The dial has spiral graduations, and is combined with a pinion meshing and screw-threaded shaft.

(1) **338,320.** (2) **338,321,** (3) **338,375. Electric Generation and Power**; Charles J. Van Depoele, Chicago, Ill. (1) Consists of a variable resistance spanning the field-magnet conductor, a number of working resistances in multiple arc, a solenoid in circuit in the main con-



338,485. STREET CONDUIT FOR ELECTRIC CABLE RAILWAY.

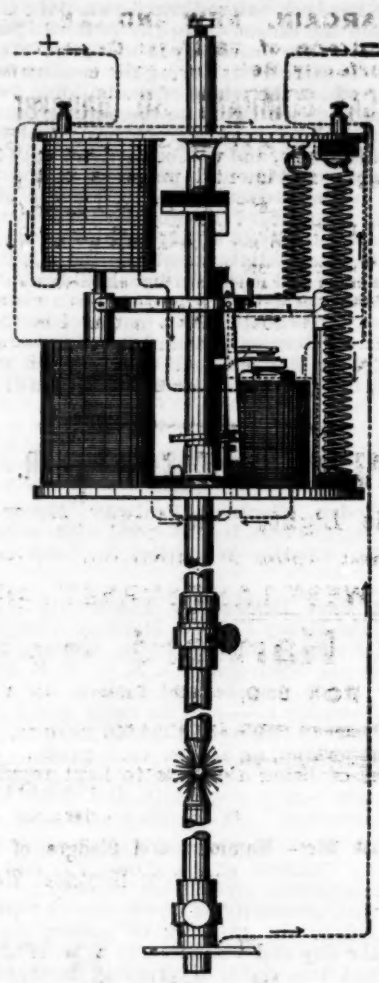
ductors, and a solenoid in parallel circuit with the working resistances, and means operated by said solenoids for cutting out the variable resistance as the working resistances are brought into circuit. (2) Consists of an artificial resistance temporarily placed in the working circuit whenever the motors or other translating devices are using less than a predetermined amount of current. (3) Consists of a main electromotor, and a minor electromotor acting independently of said main motor, in combination with a current-controller operated by said minor motor.

338,323. Electric Time Register and Alarm; Charles W. Whited, Battle Creek, Mich., Assignor of one-half to W. H. Pettibone, same place. As shown in the cut, it consists of a permanent magnet, with which the circuit wires are connected, and of a lever controlled by the attraction of the magnet, said lever by being released, when such attraction ceases, operating by means of the force of a spring or weight to stop the time keeping mechanism.

338,328. Telegraph Register; Louis Winterholder, Brooklyn, N. Y., Assignor to the New Haven Clock Co., New York, N. Y. Consists in making the indenting roller, which is carried by the armature lever, adjustable on said lever for the purpose of regulating the depths of the indentations produced in accordance with the size of the indenting roller, thickness of paper, or thickness of feed roller.

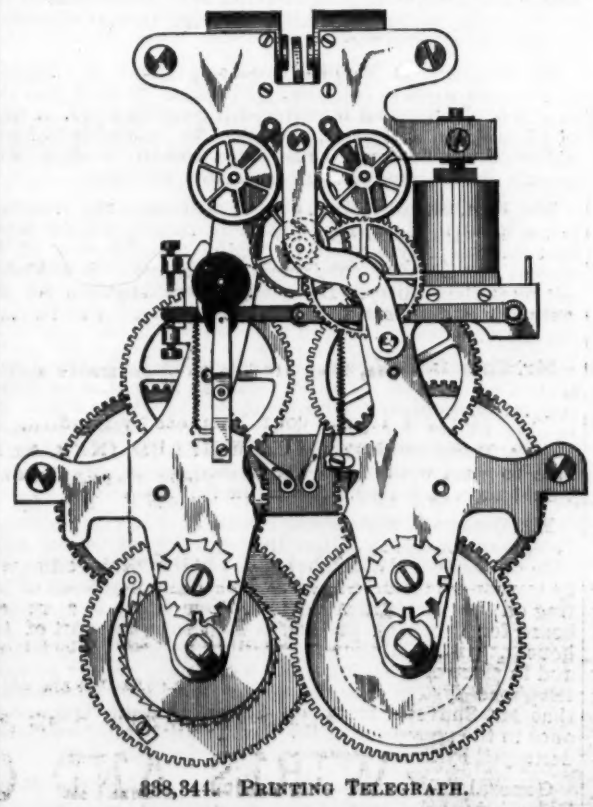
338,329. Telegraph Register; Frank B. Wood, New York, N. Y., Assignor to the New Haven Clock Co., New Haven, Conn. Consists, first, in the employment of a cutting roller in the place of a cutting pin for marking the paper where the same is in contact with another roller; second, in providing the apparatus with a slide to which the electro-magnets, the armature, the binding posts and the electrical conductors are secured, and which slide can readily be removed from the remainder of the instrument for inspection and repair; and, finally, the invention consists in providing said sliding portion with a non-conducting plate, in which the binding-posts and the ends of the conductors are secured.

338,333. Dynamo Regulator; Royal E. Bull, New York, N. Y. Consists of a device for producing a variable resistance and a dynamo-electric machine in circuit with such variable resistance, and whose field-coils are connected therewith in such manner that any increase in the resistance of such device will operate to produce a partial demagnetization of said field-magnets, and vice versa.



338,352. ARC LAMP.

338,343, 338,344. Printing Telegraphs; Stephen D. Field, New York, N. Y., Assignor to the Commercial Telegram Company, same place. (1) He includes in circuit with the condenser and dynamo-electric machine an electro-magnetic current retarder, consisting of an electro-magnet of low resistance but of large inductive capacity. (2) Relates to that class of printing-telegraph receivers wherein two type-wheels are operated by



338,341. PRINTING TELEGRAPH.

separate weight trains and are controlled by a single magnet armature. The mechanism is shown in the illustration.

338,352. Arc Lamp; George A. Mayo, Lynn, Mass., Assignor by mesne assignments to the Mayo Electric Manufacturing Company, Boston, Mass. The automatic cut-out of the lamp is controlled by the differential action of the currents in the main and shunt circuits, whereby the lamp is cut out when this differential action is zero—that is, when the main and shunt circuit currents flowing through the magnet are equal in effect. See illustration.

338,383. Dynamo; Charles Bachelor, New York, N. Y. Consists of improvements upon Thomas A. Edison's patent, 328,572, Oct. 20, 1885.

338,439. Railway Signal; William F. Ray, Springfield, Mass. Consists of details of construction.

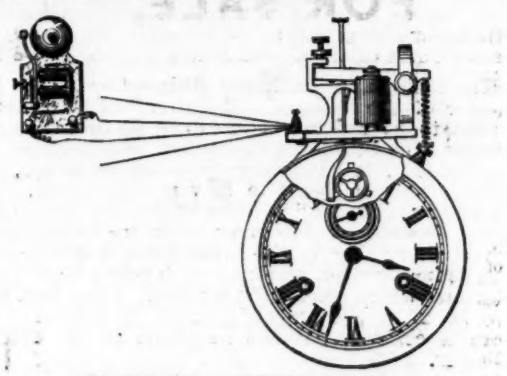
338,485. Street Conduit; Henry T. Clay, Philadelphia, Pa. The general principles of construction are illustrated in the cut.

(1) **338,491,** (2) **338,492,** (3) **338,660. Telephones**; John E. Dann and John Lapp, Honeoye Falls, N. Y. (1) Consists of socket-screws with the armature arms having points that constitute bearings or fulcra for the armatures. (2) In the second he employs at one electrode iron arranged to be influenced by the current. (3) The diaphragm is made conical.

338,518. Electric Subway; Charles C. Gilman, Eldora, Iowa. Consists of a tunnel built of asphaltum and terra cotta alternately superposed.

338,522. Poise Adjuster; Charles W. Hastings, Brooklyn, N. Y. The spring in the operating pulley is sufficiently strong to pull the poise along and overcome the slack-take-up in the other pulley.

(1) **338,549. Meter**; (2) **338,550. Automatic Coupler**; John S. Raworth, Manchester, England, Assignor to Siemens Bros. & Co. (Limited), Westminster, England. (1) Consists of a spindle which is turned by hand, a spring connecting the spindle turned by hand with a magnetic spindle, and a magnetic spindle whereby in each operation the operator in turning the spindle turned by hand puts an increasing tension upon the spring until it balances the deflecting force of the current. (2) Consists of a magnet or electro-magnet, balanced on pivots and influenced by three solenoids. Two of high resistance are units between the main leads and between the machine terminals, respectively, and are arranged to have opposing influences upon the magnet, so that when the strengths of currents in the two solenoids are equal the magnet will not move; but if the current due to the machine preponderates, the magnet will turn in one direction on its pivots and make the connection between the machine and the leads.



338,323. ELECTRIC TIME REGISTER AND ALARM.

338,556. Electric Conduit; Elias E. Ries, Baltimore, Md., Assignor of one-half to Alfred H. Henderson, same place. Consists of a peculiar combination of flanged iron girders.

338,588. Electric Meter; Sebastian Z. De Ferranti, West Kensington, England. Consists broadly in an electric meter in which the current to be measured is passed through mercury or other conducting-liquid in a magnetic field, so disposed with reference to the mercury that when a current passes the mercury is put into motion, and the movement of the mercury recorded by any suitable recording mechanism. In such an organization the movement, disturbance or action of the mercury is proportional to the current.

(1) **338,596,** (2) **338,597. Electric Meter**; Joseph L. Huber, Hamburg, Germany. The second is an improvement upon the first, and consists of a rotating face plate and a wheel having a portion of iron which passes through a solenoid located in the current to be measured.

338,622. Electric Motor; George H. Stout, Chapel Hill, N. J. The armature is located between and in the axial line of the poles, and therefore in the most effective position; a single contact brush is required, and the soft iron of the armature and the core of the electro-magnet form part of the path of the electric current through the motor, the core of the electro-magnet being connected through an intermediate wire with the source of electric energy.

338,663. Electric Cash and Parcel Transfer System; George F. Green, Kalamazoo, Mich., Assignor to himself and Oliver S. Kelly and Sol. J. Houck, both of Springfield, O. Consists in improved means for taking the receptacles from hooks by which they are suspended as the car passes the same, and in means for transferring the receptacles on the return trip of the car from the car to devices applied to receive the same.

338,683. Electric Belt; James H. Woodward, Seward, Neb. Consists of a lining strip having a series of transverse slits with a number of cups having their inner ends inserted through the slits and having wires secured to their outer ends, hooking over the slits and connected with the adjoining cups.